

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1892.—Vol. XLI.

LONDON, SATURDAY, NOVEMBER 25, 1871.

PRICE FIVEPENCE.
(PER ANNUM, BY POST, £1 4s.)

Original Correspondence.

THE NEW MINES REGULATION ACT.

From the "extra-parliamentary utterances" of Mr. Home Secretary BRUCE, of Mr. GLADSTONE, and other members of Her Majesty's Cabinet, there is every reason to suppose that the long-wished-for measure of the Government for the better management of our coal mines will be introduced next session, and let us hope will be satisfactorily and permanently settled. The frequent vexatious delays which have beset legislation upon this important matter must have an injurious tendency, both as regards proprietor and miner. It cannot be said that the trade is responsible for the delays which have occurred. On all hands it has been admitted that matters are ripe for further legislation. All parties are ready to concede that our mines are not what they ought to be, and that other questions connected with our mining interests might be materially improved by conference and imperial legislation. The Government, and the Government alone, therefore, is responsible for the fact that three sessions have passed since the new Act was first introduced, and yet nothing has been practically done. We do not endorse the opinion which has been expressed by some over-zealous partisans of the miner, to the effect that the delays which have beset the passing of this Act prove that the Government are altogether indifferent to the condition and welfare of the 350,000 men and boys employed in our collieries, but we do think that with a little more hearty zeal and determination on the part of our Home Secretary the new measure could have been discussed, and many of its most important clauses have been in operation before this.

The main provisions of the new Bill have been so frequently discussed in these columns that their purport must be thoroughly well known to all whom they most concern. The great questions are—What are the grievances under which the collier is said to be suffering; and what practical measures can be brought to bear which will remove or, at all events, mitigate some of those grievances? It must not be supposed that in seeking further parliamentary legislation with these objects in view that the proprietors and the miners are antagonistic. They are many grievances which both sides are ready to admit, and would gladly see remedied; and if any difference exists upon these points, it is simply as to the mode in which remedial measures are to be applied. For instance, in all the conferences which have been held throughout the country, and the many gigantic meetings of colliers which have taken place, the appointment of more Inspectors, and, consequently, a more efficient system of inspection, has been insisted upon as one of the chief provisions of the new Bill. The education of the colliers' children is another point upon which both sides agree; whilst the all important point of providing the most efficient plan of ventilation is of equal value to both sides, and an effective means of securing so great a desideratum would be hailed with delight by everyone connected with our colliery interests. We remember that at an important and numerous attended conference of miners, held some twelve months since in South Wales, the miners insisted "that every pit should be so well ventilated that the collier could work there in safety with a naked light." "Exactly so," replies the colliery proprietor and the manager, "we cordially and emphatically endorse your opinion. But how carry it out? Show us any practical means, and all will rejoice to carry them into effect." That is the very point at issue; and we make bold to say, on behalf of the large body of practical managers of collieries, that is the great end in view in all measures taken by them in the ordinary transaction of their business. This, too, is the great object of the new Mines Regulation Act, all its other provisions being of but secondary importance. The public, however, should be warned from expecting too much from the new Bill or any legislative enactment whatever. No Government scheme or any general comprehensive measure can altogether prevent accident; nay, until mining science, and, if we may be allowed the expression, "mining chemistry" have made great advances, explosions will occasionally occur, despite the greatest precautions on the part of colliery proprietors and managers, and the most restrictive legislative enactments. Such being the case, then, we contend that the clause of the new regulation Bill, which proposes to throw the *onus probandi*, in case of explosion, upon colliery proprietor and manager that every known means had been adopted to prevent the explosion, inflicts great injustice and hardship, and should be struck out. No prisoner at the bar, or defendant in an action, is called upon to prove his own innocence, but the prosecution or plaintiff, as the case may be, must prove the guilt of the accused. Why, therefore, this exceptional legislation in reference to proprietors or managers of mines we are at a loss to know, nor do we think it will pass the searching ordeal of parliamentary discussion and scrutiny. The early training of the Home Secretary BRUCE, in connection with some of the largest ironworks and most extensively worked collieries in South Wales, ought to eminently qualify him for legislating in reference to our mines, but probably Mr. BRUCE would have considered that the legislation which made him responsible for an explosion until he had proved that every known means had been adopted to prevent such explosion was unfair and oppressive. One view seems to pervade not only all the conferences of the working miners, but we are afraid to have a place in the minds of our senators—that the colliery proprietors are not really anxious to adopt every means which science can suggest or skill carry into effect to prevent accident or explosion. This we emphatically repudiate. The colliery proprietors, as a rule, and regarded as a body, are fully alive to their responsibilities, and have no wish to shirk their duties, however onerous; but surely there is no necessity for exceptional and partial legislation. The case of the management of a ship has often been cited as somewhat analogous to the management of a colliery. In many respects we should be glad if the analogy held good, for none would then be entrusted with the management of a colliery until he had passed the necessary examination, and received a certificate of competency. But the analogy holds good in the point to which we wish to draw especial attention. The great object of the captain of a vessel and the manager of a mine is the safety of the lives of those entrusted to his care. Despite, however, of the most careful management, a wreck occurs in one instance and an explosion in the other. After this the analogy in the two cases ceases. The Board of Trade investigate the wreck, the captain being held blameless until the proof of his

neglect or incompetence is established. In the case of the colliery proprietor, however, he and his manager are proposed by the new Bill to be held guilty until they themselves have proved their innocence. Why, we want to know, this exceptional legislation; and it is a point to which we earnestly direct the attention of the representatives of the mining interests in the House of Commons, with the view of getting the obnoxious clause expunged from the new Bill.

In making the foregoing remarks we are anxious that the public generally should understand that the colliery proprietors and managers are desirous to see the new Bill of Her Majesty's Government brought before Parliament, and its provisions fairly discussed. It contains clauses from which much good may result, whilst the uncertainty which has lately characterised legislation in reference to our mining interests is injurious to all. The Bill, however, should be most carefully watched in its progress through the House, and in Committee, and probably many salutary alterations can be devised in the multitude of councillors. However stringent the clauses, or however carefully framed the measure, as a whole, it will not be, nor can any legislation ever be, a panacea for all the grievances of the miner, nor will explosions be prevented. Let Government do its best—(let it initiate and devise the most practical means)—to meet the difficulties and dangers which beset the life of the miner, and they will be cordially seconded in their efforts by the colliery proprietors and managers generally, and with this combined action, some real and permanent benefit may result to all.

CASUALTIES IN COAL MINES.

So long as coal mining is one of the industries of Great Britain, whether we have, as now, 37 known coal fields, or that number be increased by subsequent discovery; or whether our deepest colliery remain, as now, 2276 ft. deep, or we go down to 3000 or 4000 ft.; or whether, as now, we dislodge the mineral with gunpowder and a manual pick, or by machine-wedge and mechanical drill—we shall, in any event, continue to have the winning of coal attended by accidents from which industries pursued upon the surface are exempt. That those accidents should be many fewer than they are now, carrying away as they do nearly a thousand lives every year, whilst they lead to the deaths of very many other workers, who linger on a wretched existence, no one will deny. But to bring about this most desirable result, by pointing out the means of its attainment, is not an easy matter. Royal commissions, select committees, home secretaries, and private members have all, at one time or another, done their best. Their labours have not been fruitless, or we should not have had the Mines Inspection Act, and the 12 Government Inspectors of Mines. Nor should we have raised, in 1870, nearly 113,000,000 tons of coal at an immediate sacrifice of no more than, large as that figure is, 991 lives. We will not believe that inspection has been useless; on the contrary, we are satisfied that, though it has been expensive pecuniarily, its effect has been to economise human life. Our Inspectors are chosen from amongst the most competent men in the country whose services are available, and their reports and their vigilance have together exercised a powerful influence for good upon our mine management. These gentlemen have yet to do much more good. To their recommendations, in great part, we shall have to be indebted for further improved working, following upon additional legislation. There are those, however, who do not think that the Inspectors alone are qualified to point out remedies for acknowledged evils in the workings of the collieries of the United Kingdom. Of such people is Mr. HERMON, M.P. Our readers are only too painfully aware that for some time past Lancashire, and now again after some repose Yorkshire, are districts that have been visited by colliery calamities occasioning wide discussion. To the most recent casualties in these counties we drew prominent attention last week. Mr. HERMON has wept with those who weep, but he does not confine his sympathies to sorrow for the bereaved of to-day, or to acts of liberality in the alleviation of their sufferings. With a practical mind he looks to the future, and desires that in time to come there shall be less cause for grief. With this view he would do his best to prevent in time to come what has happened in time past; and this is how he would do it. Writing to Mr. MILES MYRES, who is Mayor of Preston, he says:—

"I have felt deeply the terrible calamities that have befallen our mining population of late, and have considered whether anything could be done to prevent these catastrophes. With this object in view, I propose to give a premium of 200l. for the best essays on the subject, to be completed for by the principal miners in the coal fields of Lancashire and Yorkshire—say, 150l. for the first prize, and 50l. for the second. In your official capacity of Mayor and Coroner, I am sure you will succeed in gaining the attention of those concerned to the subject. I have no doubt that we shall find free, able, and impartial judges to decide on the merits of the pamphlets, one of the conditions being that phraseology or spelling shall not influence the decision, but the prizes to be awarded for the most useful and life-preserving suggestion."

Whether Mr. HERMON has taken the most effectual step to bring about the result he desires it is not for us to say. It is impossible but what he has done will result in good. No one of "the principal miners in the coal fields of Lancashire and Yorkshire" can turn his attention to this question with the thoroughness necessary to the taking of one of these prizes without being immensely benefited himself, and without making some "life-preserving suggestion" that may be worthy the notice of the men who will have to decide upon the merits of the respective recommendations. We will take it for granted that amongst these judges will be Mr. JOSEPH DICKINSON, the Inspector for the North and East Lancashire district; Mr. PETER HIGSON, the Inspector for West Lancashire and North Wales; and Mr. FRANK N. WARDELL, the Inspector for Yorkshire. These gentlemen are likely, amongst what will doubtless be a great deal of impracticable advice, to see at the same time that which will merit their notice, and, perhaps, suggest trains of thought which will go to improve the character of the next Mines Inspection Bill which will be introduced into Parliament. If the writers should be of the same opinion as the delegates from Yorkshire who spoke at the recent Miners' Conference in Manchester, then it may be assumed that they will lay much stress upon what they term more thorough inspection and better ventilation. Here is what is given as the substance of the remarks of the Yorkshire delegates upon that occasion:—

"Mr. DIXON, a delegate from West Yorkshire, said that as far as his experience went the mines were well managed, and the men were fairly situated. The Government Inspector had reported that during the past year there had been 46 accidents, causing nine deaths. There were 417 collieries in the district, employing 36,000 men, yet there was only one Inspector. That one, however, was very active in the performance of his duties. The chief source of danger was, however, in the presence of carbonic acid gas. Mr. SILKSTONE,

from South Yorkshire, said that the miners in his district would not rest until they received more protection, and until the inspection of mines was made effective. Better ventilation from a greater number of shafts was the great thing needed. Two lives only had been lost in the mine with which he was connected, although it produced 500 tons of coal per day. In the 20 years, however, during which he had been employed in that mine, and for some years previously, he had seen no Inspector. Other delegates from South Yorkshire complained of the defective ventilation of many of them. This defect was said to cause accumulations of carbonic acid gas, the effect of which upon the health of the miners was very perceptible. The excellent regulation of the mines generally in the South Yorkshire district was attributed to the thorough organisation of the men."

If Mr. WARDELL should be called up he would say that increased carefulness to rules on the part of the men themselves is absolutely necessary, for it is a melancholy fact that explosions of fire-damp, and all other accidents, are "too frequently caused by a wilful and reckless disregard of all instructions, and neglect to use the means for prevention in the possession of the men." If Mr. DICKINSON should be summoned he would speak of the fatal neglect of the men in connection with shot-firing, and he would dwell upon the one case which during the year 1870 was the exception to the continued satisfactory working of inspection in his district. With that one case we will not now linger. We shall have an opportunity of advertizing to it upon another occasion. Meanwhile, what would Mr. PETER HIGSON tell us? He would say that throughout the mining district generally the absence of discipline is very conspicuous. It is seldom enforced by men who have been raised from the ranks, and most of the underground superintendents have sprung from that source. It is too often the case that to have orders executed properly they must see them done, which in mines is not always possible. Men are unavoidably left to carry on the work by themselves, in parties of from two to five or six. As the underground bailiff has to go from one place to another throughout the day, the very nature of the employment, and of things generally, renders it necessary that men should do all they can for their own protection. We fully concur with the observations of a Lancashire contemporary when, in alluding to Mr. HIGSON's report, he says that many arguments in support of more stringent colliery regulations might be gathered from this report, but at the same time it is impossible to shut one's eyes to the fact that no inconsiderable number of the casualties is the result of recklessness. Thus we read that of the explosions of gas and of gunpowder in this district, by which 32 lives were lost, none, "with proper care," would have happened. "It is a well known fact," remarks Mr. HIGSON, "that all these mines emit gas, and many of them very freely;" and yet cases are mentioned of colliers going to work with a naked light immediately after gas had been liberated by the firing of a shot, of the use of naked light "contrary to instructions," and so on. It may well be hoped that to matters of this kind, and not to fancied grievances outside their own control, and upon which they can say no great deal that will prove of permanent utility, "the principal miners in the coal fields of Lancashire and Yorkshire," who intend to compete for Mr. HERMON's prizes, will give their chief attention.

THE IRONWORKS AND COLLIERIES IN YORKSHIRE.

THE STRAFFORD COLLIERIES.

Amongst the various seams of coal raised in the Midland field the Silkstone is about the most valuable, rivaling for household purposes the Wallsend of the North, and alike excellent for the production of gas and coke. An average quality will produce about 11,000 cubic feet of gas per ton, with an illuminating power equal to about sixteen candles. Worked to the south of Alfreton, on the Erewash Valley line of railway, the seam proceeds in a pretty straight line through North Derbyshire to South and West Yorkshire, varying in quality and thickness and in its geological features, and being remarkably rich in its fossil flora. Overlying it in several districts is some of the finest clay-band ironstone in the kingdom. The best qualities of the coal, however, as a whole, are those got in South Yorkshire, the deepest of the shafts in connection with which being those connected with the Stafford Collieries. The latter derive their name from the great Lord Stafford, who was the owner of the land for some miles around, and who resided not far from the site of the present mansion—Wentworth Castle. The pits are situated about two miles from Barnsley, in a highly picturesque spot, not far from the gates of Stainborough Park, and are merely sheltered from the castle by a fringe of fine timber on the rising ground.

The collieries are replete with all the appliances necessary for raising the coal expeditiously, sending it away in a marketable condition, and for economising human labour. There are also several important inventions recently introduced, and which are worth especial mention, and which will be more fully noticed hereafter. There are no less than five shafts, three being to the Silkstone bed and one each to the Parkgate and Flockton beds. The Silkstone seam is 240 yards deep, the drawing shaft being 11 ft. in diameter inside the walling. The headgear of massive timber is about 27 ft. high, and the pulleys 12 ft. in diameter. Double-decked cages are used in the Silkstone Pit, drawn by flat wire-ropes, four corves containing 32 cwt. of coal being raised at each draw, the time taken in drawing from the bottom to the top being about 35 seconds, or one minute in being raised from the bottom to being returned to the cage. Close to the top are two engine-houses for the different pits. For the Silkstone bed there are a pair of vertical engines, with 27-in. cylinders, the motive-power being supplied by four plain cylindrical boilers 36 ft. long and 4 ft. in diameter, together with one double-flued Cornish boiler, 30 ft. long, 7 ft. in diameter, the flues being 2 ft. 9 in. in diameter, and having five Galloway tubes in each. At the bottom of the pit, which is lighted with gas, there are a pair of horizontal engines, 14-in. cylinders, for drawing the coal along the planes. They are by Carratt and Marshall, of Leeds, and are worked by two single-flued Cornish boilers, 18 ft. long and 5 ft. in diameter. They work two ropes on the engine planes, one being to the east and the other to the south. The plane on the level is worked by what is known as the tail rope, and the other in the dip by a single rope. The system of working adopted is the "long wall," being that generally adopted in South Yorkshire, the workings at the present time extending about one mile to the south and half-a-mile to the north-west. To the north-east there is an extensive fault, being an upthrow of about 60 yards, by the side of which the men are about to work, as it will be reached shortly. The fault is, no doubt, the one which starts from Eleacar, varying from 20 to 70 yards in thickness, and passing the dip side of Stafford goes past the Sovereign Colliery, and from

thence to Silkstone. The system of ventilation is by furnace. The upcast shaft is 12 ft. 6 in. in diameter in the inside: 80 yards from the bottom of the pit there are a pair of furnaces connected with the upcast by means of a dumb drift, which goes into the shaft 18 yards above the return air. There are two grates of the ordinary type, 9 ft. by 6 ft. As a rule, very little gas is made in the pit, but on several occasions there have been serious outbursts of gas, causing the whole of the men to beat a precipitate retreat. Fortunately, the use of the Stephenson lamps, and the care taken of them have prevented any accident. In his report Mr. Wardell, the Government Inspector, alludes to those outbursts at Stratford, remarking "That if on those occasions there had been a single naked light in use the lives of the whole of the men in the mine, to the number of 300, would have been sacrificed." It would thus appear that in mines where little or no gas is ordinarily made they are liable to those sudden outbursts, so that the only safeguard appears to be the rigid enforcement of the use of safety-lamps, always kept in perfect condition, and the isolation as far as possible of the return air from contact with the ventilating furnaces. About 80,000 cubic feet of air pass through the workings every minute. Anshoving that every precaution is taken to ensure safety, there is a telegraphic apparatus in the pit, designed by Mr. Bailey, of Wakefield, by which persons in any part of the engine plane can communicate with the engineman at the top. The system is very simple, the necessary manipulation being confined to the pressure of the fingers on two wires. Mr. Miller states that the apparatus has answered remarkably well. The following shows the principal seams of coal gone through before reaching the Silkstone bed:—

Joan coal	0 yd. 1 ft. 8 in.
Flockton top coal	0 2 11
Flockton bottom coal	0 1 8
Cannel coal	0 1 7
Flockton thin coal	0 1 0
Fenton thin coal	1 0 0
Coal	0 1 3
Parkgate top coal	0 2 7
Parkgate bottom coal	0 1 2
Thorncliffe thin coal	0 2 2
Coal	0 1 3
The black shale ironstone mine	2 0 0
Silkstone top coal, about	0 2 10
Dirt and dust	0 0 8
Silkstone bottom coal	0 2 8

The Parkgate Pit is 136 yards deep, the shaft being 9 feet in diameter. The head-gearing is about the same size as the Silkstone, the drawing being done by an 18-in. cylinder engine. The boilers at the Silkstone Pit drive the engine, but new engines and boilers have been ordered from Manning and Co., of Leeds; they are to be the same as those shown at the last London Exhibition by the firm named, the boiler being a tubular one, and placed above the engine. New head-gearing is also being put up, as it is intended to more fully develop the workings. At present there is only a single-decked cage, bringing up one corvee at a time, the output being about 250 tons per day. The coal is about 4 ft. thick, independent of a band of dirt running through it.

The Flockton Pit is similar to the Parkgate, so far as the headwork is concerned, and is only 60 yards deep. The pit is at present not being worked, and it is expected the Fenton seam, which is of very good quality, will be got instead. The pumping shaft is 10 ft. in diameter inside the walling, there being a donkey-engine for letting the men down when necessary. There are two sets of 12-inch pumps, 60 yards down to the Flockton Pit, and one set of 12 in. from there to the Parkgate, driven by a pair of double-acting engines, which force the water from the one pit to the other. There are also a pair of 4½-in. double-acting rams, with a 9-in. cylinder horizontal engine, for forcing the water from the Silkstone to the Parkgate Pit. A great deal of the coal raised is sent to the London and southern markets, the demand, in fact, being in excess of the ability to supply. There is a line of rails on to the Wombwell station of the Manchester, Sheffield, and Lincolnshire Railway, and which is extended some considerable distance further, taking the wagons from Mr. Clark's Old Silkstone Collieries, as well as others. There are all necessary workshops, including blacksmiths, carpenters, sawyers, &c., all of which, together with the pit bottoms and offices, are lighted by means of gas, for the production of which there are the necessary works, and two gasometers.

There is a very extensive field of coal to be worked, the principal lessor being Mr. F. W. T. V. Wentworth, of Wentworth Castle; a small portion, however, is held under lease from the Duke of Leeds. The colliery, which was started a few years ago by the late Mr. W. Smith, of Beevor Hall, near Barnsley, and Alderman Carr, of Sheffield, is now the property of a small limited company, including the representatives of the first named gentlemen, Mrs. Ingram (*Illustrated News*), Mr. Parry, late M.P. for Boston, and three or four others. Mr. J. Warrington, of Worsborough Hall, is the managing director, and Mr. R. Miller the resident viewer.

Amongst the novelties in operation at the collieries are some improved methods of screening and loading coal. Not the least interesting is Hick's patent screen, with revolving bars, for screening and sorting coals, ores, &c. It is composed of a number of round bars set in a frame, and each bar is made to revolve in such a direction that any "choking" of the screen or "grinding" of the material is rendered impossible. The space between the bars from the gauge of the coal, and the screening is carried on very expeditiously, whilst by the mode in which the screens work, with little fall, less injury is done to the coal than by the ordinary method, where the fall is considerable. The coal travels over the screen at a slow speed, so that the separation is most effectual. By that method the coals on being brought to the bank are shot into a dead-plate, and so slide on to the revolving bars; the large coal then passes along the upper surface of the bars, and into the wagons, the small coal being allowed to fall into a hopper or box placed over the trough. The gearing being under the dead-plate is so placed that no dirt can fall upon it, whilst the working part can be greased by raising the lower part of the dead-plate, which is hung on a hinge. The lower ends of the bars revolve on pins which are attached to the frame; the ends of the bars being bored out and fitted on to pins. The lubricating of the pins is effected through holes in the bars, kept closed against the egress of dust by countersunk screws. The screen at Stratford has eight bars of equal dimensions, 6 in. each, and is driven by a small steam-engine, which is fitted under the dead-plate, and is, therefore, easy of access. The patent screen takes two corves for one by the ordinary method, and when in full operation will take 16 cwt. per minute, without either shovelling or raking, requiring only two boys to pick out the coarse coal and dirt; and the coal drops into the wagon with no more breakage than if dropped over the wagon side from the hand. Besides the large coal which passes over the bars, three qualities of coal are screened. From the narrow spaces at the upper end the smallest coal and dust pass through; the next series of diameters having wider spaces, smithy coal and nuts pass through; whilst with the next diameter and spaces nut coals are passed.

Another method adopted at the colliery with every success for screening is by means of an endless chain of square links of iron, which travel through under the main screens, and in any length of fixed cast-iron troughs or boxes, in which the links fit and travel, so making a series of boxes receive the rough small and continually move; whilst a fixed trough carried by upright frames and trussing reaches an elevated hopper, where the links discharge as they pass out of the trough. They are worked by a small engine on a square drum, and having a round drum or roller at the further end, where they are passed under whatever number of screens may be required. The troughs are (say) 110 feet in length, 9 inches wide, and 6 inches deep. The chain is formed of square links of flat iron riveted together. The under part or right of the endless chain passes down underneath the trough, and is supported by three bearing pulleys to prevent unnecessary strain or vibration to the chain. The small coal is divided into three sorts, and is run from where discharged out of the boxes over wire screens into three compartments at an elevation for railway wagons to pass under or load in a very short time through spaces in the bottom, which are closed and opened by a lever and sliding doors. By the system 160 tons of small coal can be screened in eight hours. The great success which has attended the system of screening described, and now in daily operation at Stratford, will, no doubt, lead to its being extended not only in South Yorkshire but in other mining districts throughout the country.]

CLEVELAND:

ITS PAST, PRESENT, AND FUTURE, IN RESPECT TO ITS MINERALS AND MANUFACTURES—NO. IV.

Cleveland had now entered the list of iron-producing districts, and had joined the race. Hitherto it had taken no part whatever in the discussion which had been continued for many years past as to the relative merits or demerits of certain kinds of cast-iron stoves, but now her ironmasters considered they had some claim to be heard. Hitherto they had been only observers, but observers of the keenest kind; not any invention of value had escaped their notice, and all was treasured up ready to be reproduced when their schemes were fully matured.

Cleveland had, of course, adopted the most approved plans of cast-iron stoves. In 1858 Jones's Patent Stove was erected at the Normandy Ironworks, near Cargo Fleet. This consisted of circular pipes, 10 in. diameter, within which were placed 8-in. pipes; the heat was applied to the outside of the larger pipe, and returned to the chimney down the inside of the smaller one, the blast ascending from bottom to top of the pipes within the annular space, 1½ in. broad, and thence passing off to the furnace. This stove, however, did not meet the wishes of the iron producers; it failed owing to the unequal expansion of the inner and outer pipes, as well as the large number of joints required.

The district was stationary in respect to new inventions or improvements in cast-iron heating stoves for many years; indeed from 1858 to 1862. Experience, however, was being gained, and although it was at a great pecuniary loss to the iron manufacturers, yet they afterwards were benefitted immensely.

In 1862 Mr. Robert Morton, of Stockton-on-Tees, conceived an idea for the construction of a stove which he believed would be superior to others in operation, inasmuch as it overcame many of the defects noticeable in the others, and which had led to their failure. He accordingly secured a patent for his principle. The inventor of this refrigerator observed that by flattening a 4-in. pipe he increased its circumference inversely to its area, and thus in transmitting the heat from one fluid to another he did this with the least possible expenditure of metal in proportion to the heating surface, and his refrigerator was so well contrived and carried out, that the tubes being 8 in. deep by ½ in. broad, he was enabled to cool a barrel of boiling wort by means of a barrel of cold water, the latter passing off at a temperature of 210°, and the former also flowing away within a degree of the temperature of the entering water—say, 54°.

Mr. Morton having constructed his apparatus, caused the water to enter at the cold end and flow through the flattened tubes in one direction, whilst he caused the boiling wort to flow over and under the tubes in a contrary direction. The inventor designed the refrigerator more particularly for the cooling of worts and other fluids; stoves, however, were the results. The hot-blast stoves on Morton's principle were constructed with 20 pipes, each 8 ft. long, 3 ft. deep, and 5 in. wide inside. These were placed on edge, were 1 in. thick, and set 5 in. apart, and the ends were connected with boxes, which had a sectional area of 1½ times that of the pipes. By this means a sectional area for the course of the blast was secured equal to a 14-in. pipe, whilst a surface was gained equal to a pipe 27 in. diameter. The stove contained 1120 square feet of effective heating surface. Plates were placed over the pipes at such a distance as would allow three times the sectional area of the flue for the bend in the flame, and also to allow of sweeping the same by raising the plates. End doors were also provided, for the purpose of sweeping the pipes, and for the cleansing of the flues under them.

At first the stove was heated by a fire-grate 8 ft. by 3 ft., and on the pyrometer being applied it was found there was a temperature of 100° at the outlet. Pyrometers were then placed in the 20th pipe from the cold end, and in the 14th and 7th, and the readings showed 1000°, 450°, and 150° respectively. In the 1st the temperature was about 100°; thus every pound weight of coal burnt was accounted for in the blast. The pipes of this stove were cast with flanged joints; and this was a weak point in an otherwise tolerably good stove, as it gave way to the expansion and contraction on Sundays.

One great difficulty lay in the protection of the first two, and eventually of the first five or six pipes, as they were least able to withstand the heat, although cased with fire-clay lumps, owing to the blast being at its greatest intensity. Finally, when gas was used in the works, flues were carried along the top and bottom of the first seven pipes, after which the gas travelled over and under each pipe in succession to the stack. At the same time the seven last pipes were removed, as it was found that they did not add to the heating power, the heat being absorbed by the earlier pipes before it reached them. Finally, the constant leakage, and other causes, led to the stove being abandoned. It failed from mechanical causes, but was considered excellent in principle. In addition to the above-mentioned system, we find the Blaina oven at work in several localities. This consisted of a flattened pipe, about 15 in. by 3 in. or 4 in. broad, by 1½ in. thick, bent over at the top, the two legs being entered in different boxes; in length this varied, but was generally 12 ft. to 14 ft. These were placed either vertically or at an angle, meeting at the top. Each stove contained five or six in a row, and occasionally there were two or three rows, the blast flowing through each pipe in a row in succession.

This system of stove was tried, as before mentioned, at Ystalyfera in 1834 with round pipes, and was abandoned owing to the great amount of friction. Cleveland, however, met this difficulty by having three or four stoves, with two or three mains in each working to the furnace, and thus was the friction reduced to about ½ the difference between the blast in the engine-house and at the tuyeres.

On this system, with the addition of radiating projections, bars, and cones, was Gauntlett's Patent Stove, of which several were within the district. The same pipe, with the corrugations running in the direction of its length, was brought out about this time, with the same end in view—the transmission of the heat from the metal to the blast, whilst others preferred them plain, as at first.

The stoves generally adopted, however, in Cleveland were those with double pipes, 14 ft. to 15 ft. high, with a section of 15 ft. long by 4 in. broad. This construction of stove, when placed five or six down on each side, stood the gas pretty well, but failed entirely at the South Durham Company's works, when heated by coal fires. These failures were of service to the ironmasters, in making them thoroughly acquainted with the element which they had to struggle against, and although they had a series of failures—failures at least when compared with their anticipations, but a grand success when the low temperature and inefficiency of the first stoves are compared with those of recent date—still they laboured on, and let us observe the result.

Mr. Giers, an engineer of ability, and now partner in the firm of Giers, Mills, and Co., of Middlesborough, conceived the idea of erecting a furnace plant consisting of from five to six stoves, with two rows of pipes in each, the gas being admitted at the hot end, and which should flow off at the top near the cold end. The results were rather satisfactory, but still did not attain what was desired.

Mr. John Player, of Norton, near Stockton-on-Tees, an engineer connected with blast-furnaces in the district, adopted what is known as the Welsh plan, which consists of a stove with round 8-in. cast-iron pipes; 14 to 17 ft. high, and 18 pipes to each stove, which was distinguished with a special arrangement of combustion chamber—a Player's patent. These stoves, as applied by the Norton Iron Company (Limited), near Stockton-on-Tees, to each of their large furnaces, are eight in number, and each has 15 pipes, and contains 250 tons of pipes per furnace, or about 7500 square feet of heating surface. They appear to give satisfactory results, especially when applied as a system unbroken by any other construction of cast-iron stove. The same kind of stove and appliances gave good results at Ferryhill.

The next system bears resemblance to Morton's, although the application has been more successfully carried out; it is the invention of Mr. Benjamin Ford, draughtsman, formerly with Messrs. Bolekow, Vaughan, and Co., and now with Messrs. William Whitwell and Co., of the Thornaby Ironworks, Stockton-on-Tees, who, however, unfortunately for himself, did not get it patented.

The stove consists of pipes 12 ft. high by 3 ft. deep by 10 ft. wide, placed vertically in separate boxes, the foot of the pipe being divided, each part slipping into a separate box. The pipes thus form a wall

of six in a line. The gas enters at the hot end, and flows horizontally along the faces of the pipes into vertical flues at the cold end, and the gas thus travels against the blast, which ascends and descends the pipes. Six pipes in line form a section supported with suitable hot and cold valves, arched in, and so arranged that a pipe can at any time be removed from a section without disturbing the rest of the stove. This is a great point gained. Considerable ingenuity is displayed in the arrangements for joints, firing with coal, &c., and this stove appears, for the weight of metal used, to give more satisfactory results than any other cast-iron stove. Of course, it is liable, like all other cast-iron plant, to be damaged by excess of heat, but not more than others. Ford's stove is extensively adopted by Messrs. Bolekow, Vaughan, and Co. (Limited), of Middlesborough, Wotton Park, &c. Thus far it must be admitted Cleveland had kept pace with other districts in respect to the improvements which had been introduced in stoves for heating the blast.

Having accomplished great and important changes, and having obtained stoves vastly superior to the first ones introduced into the district, we might fairly presume that attention would be given in a smaller degree than hitherto to the subject of hot-blast stoves. It was not so. The ironmasters, indeed, more than ever gave their attention to the matter, being convinced that every increase of temperature was a saving in the cost of production. One point especially claimed their notice—the wear and tear of cast-iron pipes, and the enormous expense incurred. The depreciation alone on a cast-iron stove is from 20 to 30 per cent.

We now approach what we may appropriately term the second era, inasmuch as we find an entirely different construction of hot-blast-furnace stove, known as the regenerative principle, is introduced. The plan of a stove on this new method of construction was first patented and made public by Robert Stirling, in 1817. Stirling patented the heating of airs, gases, and fluids by the agency of airs, gases, or fluids, by means of passages formed of brick, metal, stone, or any suitable material re-adapted to the degree of heat required, substantially as before described, and after showing how his system could be applied to the manufacture of glass, pottery, or anything where great heat is required, he left it at this point.

In 1856 Mr. Frederick Siemens patented improvements in furnaces. The hot air from the furnace is passed through chambers containing refractory materials, presenting a large surface, and air to support combustion is passed through the same chamber, in the same or opposite direction, alternately with the hot air, so as to become heated. Two such chambers may be used, the flame passing always through one and air through the other; the alteration in the current is produced by valves. The chambers may be so arranged that the products of combustion shall pass through one passage, and the air through another, simultaneously, such passage being heated by conduction only, and these passages may be either zig-zag or tortuous.

Other hot-blast stoves, on the regenerative principle, were introduced in Cleveland, of which we mention that of Cowper, patented May, 1857. The principle is such that the air under pressure is heated by being passed through generators consisting of air-tight cases of iron, lined with fire-brick or other non-conducting material. A number of tortuous passages are made for the air, and another set of passages is in close contact with them, which serve for the products of combustion. Two regenerators may be employed, and the air and products of combustion passed through them alternately. The waste heat of a blast-furnace or other similar furnace may be used to heat regenerators as just described. The regenerators are fitted with fire-clay or other refractory materials in lumps. The speciality, however, consists in enclosing the regenerator in an air-tight case.

This invention was soon put to the test, and its practicability was proved by the erection of a trial pair of stoves at Messrs. Cochrane and Co.'s Ormesby's Ironworks, Middlesborough. It was so satisfactory to the firm that they erected two stoves 19 ft. in diameter, by about 18 ft. high, with domed tops. Within an air-tight casing, lined with 18 in. of brickwork, a centre shaft 4 ft. diameter was constructed, the annular space surrounding which was fitted with bricks in the form of a regenerator, and beneath this circular flues connected with the chimney were constructed. When the stove was being heated the gas was admitted by the centre shaft, duly mixed with air for combustion, which, arriving at the top, descended through the open brickwork to the flues, whence it was conducted to the chimney. This was continued until a stratum of 3 ft. or more of brickwork was heated red-hot, the rest shading off to blackness. When the stove was sufficiently heated the blast was turned on, and entering by the circular flues, it ascended amongst the heated bricks, and passed off down the central flue at a red heat to the blast furnace. Simultaneously with the erection of these stoves two pairs were erected at Messrs. Bell Brothers, Fort Clarence Furnaces, near Middlesborough, which were heated by the blast furnace gases. The results at first were encouraging, the heats were excellent, zinc and even antimony being freely out by the blast issuing at a red heat, but after a short time the stoves became choked with the dust of the blast-furnace gas, and after ineffectually endeavouring to surmount this difficulty by the application of circular fire-brick tubes in place of bricks only, the plan was abandoned. It was added to the long list of failures. The stoves, however, at Messrs. Cochrane and Company's furnaces were now nearly completed, and the firm were anxious to avoid the disasters which had occurred at Fort Clarence, and, therefore, decided to erect Siemens's gas producers, and in this manner supply the stove with pure gas. This met the case, and as compared with the cast-iron plant of the time, the stoves on this principle effected a saving of 5 cwt. of coke per ton of iron made, which was equal to about 3s. per ton, or (say) a saving of 2500l. per annum in each furnace. The subject was, therefore, of the highest importance to ironmasters: it was worthy their best attention.

COLLIERY EXPLOSIONS, AND THEIR PREVENTION.

Sir,—This subject must, it is to be feared, occupy the attention of mining engineers and the general public for a long period to come. It is pretty commonly accepted as an axiom that "those awful accidents will happen, whatever exertions, skill, or science, are put into practice," but this will not be agreed to by men generally; it is absurd to expect it. The science of mining, like all other kinds of engineering, must continue to advance. Your Correspondence lately has strewn forth ideas that are well worthy of the most careful consideration. The proposal of one correspondent, to bore holes up to 2 ft. diameter at various points, in order to drain off the gas and improve the ventilation, is well worthy attention; but, perhaps, after all the bolder course now proposed, to sink shafts to the rise in all cases, and systematically drain off the gas, is preferable to any small measure, which might be only a kind of tinkering, while something like a radical cure is wanted.

I cannot pretend to have given anything like that close attention to the plans of Mr. Joseph (as noticed in the Supplement to last week's Journal) which they appear to deserve, but intend to do so on the first opportunity I have. I may, however, perhaps be allowed to remark that his plans appear to be very comprehensive, and to have also been fully tested by experience; but they do not seem to be original. No doubt, however, his application of the system is on a more extended scale than, perhaps, has been tried previously. The first proposal I recollect to adopt the general system of draining goaves and works of gas by natural laws is to be found in the plans of Mr. Gibbons, a Staffordshire coalowner, who was examined before a parliamentary committee in 1849. Mr. Greenwell also wrote a paper, which will be found in the Transactions of the Northern Mining Institute, Vol. II., "On the Greater Facility for Ventilating Dip than Rise Workings;" and the paper has an evident bearing on the subject in hand. Mr. Greenwell shows clearly that dip workings can be much more easily ventilated than rise workings, as it is difficult to force the currents to the rise comparatively, and bring the gas down towards the dip. A paper will also be found in the Transactions, Vol. VII., on "Ascensional Ventilation, and Drainage of Goaves by Gas Drifts to the Rise." But the system of Mr. Joseph differs in some important points from any of those mentioned, and, no doubt, the general features of his scheme are sound; but it would be a great mistake to suppose that by attending to them alone these dire accidents would be prevented; it would, indeed, be an easy task to point out instances where his plans have been followed to a great extent,

and yet these works have been visited with the greatest disasters that have ever been recorded.

The winning and working of the Black Vein, at Risca, in Monmouthshire, was pretty nearly in accordance with Mr. Joseph's views. The coal was worked from near the outcrop down towards the dip for many years, and during this time many serious explosions occurred, the last of them being about 1854, perhaps the most awful on record, a very large number of lives being lost. It is, however, perhaps fair to observe that the plans of Mr. Joseph were not carried out here entirely, as the upper seams were not worked, for the very good reason that they were not workable to profit, and I would also submit that even when this can be done it will not have the desired effect in very deep mines, where the seams lie at a considerable distance apart, as in those cases the drainage of the under seams is not effected by the working of the upper. As observed in this case, at Risca, the upcast shaft was sunk very near the outcrop, and the working shaft further towards the dip, but at no great distance, the depth of the upcast being about 18 fms., and the downcast 70 fms.—very unfavourable, it will be observed, for furnace ventilation. The airways here were of large size, and no expense was spared in keeping them, and it is possible that if the Guibal fan had then been known, and a large one in use at the top of the very shallow upcast shaft, it might have been possible to work this very fiery seam safely with open lights. It must be borne in mind that it was a very fiery seam, and the men had a decided objection to working with safety-lamps.

There are some points in the plan referred to which will be difficult to reconcile with any recognised system of ventilation now in use; the proposal to work away, or rather to leave no barriers at all, for instance; but I must postpone some further remarks to another letter.—*Newcastle Nov. 22.* VIEWER.

[TRANSLATION.]

NEW PROCESS FOR THE PREVENTION OF COLLIERY EXPLOSIONS.

SIR,—To put an end to those terrible explosions of fire-damp, the frightful human hecatombs, which annually make so large a number of victims, is the great problem for which, for many years past, humanity and the industrial world have loudly called upon science to find a solution. To this end a great number of processes have been proposed, but all have left the question in the most profound darkness, and the catastrophes, succeeding each other, are even more frequent and more terrible. This non-success of science denotes that in the means proposed there is a radical defect, and a careful examination has shown that this defect consists in that the divers means put in operation do not diffuse nor remove the deleterious gases with sufficient completeness. To remove this grave inconvenience they have in France and in Belgium wisely prescribed the erection at the top of the pits, or other ways serving for return air-ways, of powerful machines, instantaneously displacing large masses of air, but experience has shown that in many cases, which it will be unnecessary to enumerate, this means is still insufficient. To overcome this they have had recourse to auxiliary processes, such as brattices, small ventilating pumps, and blow-georges; but not only have these means failed to give efficacious results, but they may even be considered as propagators of the chances of explosion.

Starting upon these facts, and turning to account my 20 years' experience as a colliery engineer, I have devoted myself during five years to the exclusive study of this important question, and have succeeded in arranging a simple process, to which I have very fully referred in a series of articles published in *La Houille*, which satisfies all the exigencies of humanity and of industry. In the opinion of engineers extensively versed in the art of mining, it is considered that in large workings, supplied with a good current of air, my process would render very great services, and especially in the more difficult cases; and that in workings of mean or minimum extent my process, combining its action with that of natural ventilation, or of any kind of artificial ventilation, is sufficient to completely purify the workings and place them entirely beyond the reach of explosion.

The peculiar merits of my process are, firstly, that it attacks the evil from its beginning, and that it deals with it without giving it time to develop itself; and, secondly, that its application is most easy and practicable, that it leads to no danger, and, moreover, that it is less costly than any other process whatever. To sum up, my process operates in such a manner that when it is in operation in places in the worst condition, whether through ventilation or laying out of the works and escape of carburetted hydrogen, I could readily purge the workings of all the fire-damp which may be accumulated there, as well as of any carburetted hydrogen that may be disengaged during the operation, and place the workings beyond the reach of explosion, except, of course, from foul play, from considerable irruptions of gas resulting from great falls, or from suddenly breaking into old workings filled with fire-damp, or from the very exceptional occurrence of fire and the disengagement of fire-damp occurring simultaneously.

Being entirely unacquainted with the English language, I should be very glad to find some gentlemen of integrity, and connected with collieries in England, who would undertake the development of the invention in that country, and to such gentlemen I should be willing to furnish all necessary particulars. JULES FAVER, Mining and Civil Engineer.

Rue de Grenelle, St. Germain, Paris, Nov. 18.

ROYAL COAL COMMISSION REPORT.

SIR,—In the Report of Committee E, contained in vol. 3, and at page 121, there is an inaccuracy which I trust I may be pardoned for observing. The compiler of the report has, however, done me the honour of borrowing his account of the Forest of Wyre coal field from my writings, and of saying that they are "by the pen of a man well acquainted with the district." My acquaintance with the district enables me to say that the section of the coal strata of the Forest of Wyre, as "given by Mr. Talbot Aveline, of the Geological Survey," so says the report, is inaccurate, if it is intended to represent No. 1 sandstone and shale 76 ft. as the uppermost stratum. We usually read pit sections from the surface downwards, or from upper strata downwards; and, as there is no note making any exception in this case, I presume the compiler of the report so meant it to be read. But Mr. Talbot Aveline is not answerable for this inaccuracy, because it will be seen that his section, as given on the horizontal section sheets No. 50, of the Geological Survey, is intentionally inverted, to enable him by dotted lines to connect the coal seams of the horizontal engraved section with the printed description of the strata and coals, with their thicknesses in feet, so that No. 7 of the section, given in the Report of Committee E, is the uppermost in the series; and here let me add that it is not in any way typical of the deposits of the Forest of Wyre coal field as a whole, though it is of the outlying area between Prizeley and Abberley to some extent. My object in calling attention to this error is not to reflect upon the compiler of the report, but to get it corrected, for I find it to be an error which has already led people astray. Prof. Hull has fallen into it in his "Coal Fields of Great Britain," and, referring to Mr. Aveline's section, says—"At Kinet the lowest coal seam in the above section is of good quality, and reaches a thickness of 5 ft." The fact is that the good coal of Kinet lies beneath many yards of the coals which answer to those in Mr. Aveline's section, and if there is any force in the comparison made by Mr. Hull it no longer holds when we find that the lowest coal in Mr. Aveline's section is in reality the highest. Mr. Hull has referred to Mr. Aveline's section, and admits the error which is obvious, promising to correct it in the next edition of his work. Then I find in a report by a mining engineer well known in South Staffordshire the following remark:—"At Harcot also, near Kinet-park, four thin coals were met with, together with argillaceous ironstones, which appeared to establish a satisfactory identity with the Pool House and Mable district." It seems likely that he has fallen into the same error by reading Mr. Aveline's section improperly, or by adopting Mr. Hull's remark. There are certain sulphur coals, associated with spirorbis limestone, lying many yards above the Harcot Sweet coals, and there is no doubt that these are the same sulphur coals as are associated with spirorbis limestone in the Pool House and Mable district. The Harcot or Kinet coals,

which are sweet and associated with beds of argillaceous ironstone deposits, lie at a much lower level, and, as I have endeavoured to show in an article in the "Geological Magazine" for August last, can be correlated with coal measures of the two Cleve Hills, and with the lower portion of the Coalbrookdale deposits, taken from the Best coal downwards. DANIEL JONES, F.G.S.

WASTE OF FUEL—THE COAL COMMISSION.

TO THE EDITOR OF THE TIMES.

SIR,—The recent report by the "Coal Commissioners," together with its accompanying reports of committees and minutes of proceedings, points several lessons which may be studied with advantage to all, and suggests many points for consideration which do not appear to have come within the scope of their enquiries. To one of these I will now, with your permission, briefly draw attention, in the hope that abler pens than mine may follow up the subject, and enforce public attention to a question which is of vast national importance; I refer to the loss and waste which now occur not only in coal mining, but in every stage through which coal subsequently passes until it arrives at its final destination for consumption. Committees B and C of the Coal Commission reported respectively on "waste in combustion" and on "waste in working." Besides these there is also a "waste in transit," which in some cases is very considerable. The report of committee B deals fully with the question under consideration, and its general tenor is "that, without doubt, coal is wasted by carelessness and neglect in large quantities." The report of committee C is brief, and it would be of but little value in itself without the aid of the voluminous evidences upon which it is founded. The loss by working is thus summed up:—

"At present, under favourable systems of working, the ordinary and unavoidable loss is about 10 per cent., while in a large number of instances, when the system of working practised is not suited to the peculiarities of the seams, the ordinary waste and loss amount to sometimes as much as 40 per cent."

Upon further enquiry into this subject, I find that the greatest amount of absolute loss—namely, that which is left below in the pit and never brought up to the surface—occurs at steam coal collieries, the "small" from which will not coke, and is, therefore, considered to be worthless. But is this the case? During a recent visit to South Wales I saw large quantities of what is called "patent fuel"—that is, small coal agglomerated with pitch or tar, and then pressed into blocks—and upon enquiry I learned that the demand for this patent fuel for shipment from the ports of Cardiff and Swansea was in excess of the supply; yet we see the anomaly of hundreds of thousands of tons of the principal material required for its manufacture being annually rejected as not worth raising, and which in a short time becomes irrecoverable. Although patent fuel may not, perhaps, take the place of block coal for steam purposes at home, where the latter is so abundant, there exists every reason why it should be preferred for shipment, since it occupies much less space in stowage, and can be carried with a smaller amount of loss than round coal. It might also, however, be beneficially used for steam purposes at home, since in all the experiments in which it has been tested, so far as I have been able to ascertain, the steam-producing powers of patent fuel have exceeded those of the coal in its natural state. So long as the supply of this fuel is less than the demand for it for foreign shipment it is not likely to come much into the home market, but there seems every reason to believe that with an increased supply the demand would also increase; and, as I have already pointed out, the supply of raw material for the manufacture is to be had in almost unlimited abundance, or, at any rate, in far greater quantities than could be utilised in that manner. Committee C states in its report that it "hesitates to suggest how far the Legislature may deem it expedient in the public interest to deal with any of these sources of waste by special enactment." I would, however, suggest, Sir, that the Legislature should deal with this question, in the public interest, by enacting that no small coal shall be left below in any coal pit beyond what may be unavoidable, or which for one cause or another it may be impossible to get it out. The amount of small coal raised in many colliery districts would then increase to such an extent that it would be necessary to find a market for it somewhere, and that market, I confidently assert, would be found in the extended manufacture of patent fuel. It is erroneous to suppose, as many do, that patent fuel is only applicable for steam purposes, and that it is unsuited for domestic use. It is true that fuels made with a large combination of bituminous matter would not be pleasant in our drawing-room grates, and it might impart an unpleasant smell, and possibly a foreign flavour, to our food, if it were used for culinary purposes; but all patent fuels are not made in this manner.

During a visit two years ago to the patent fuel manufactories in South Wales, when I was investigating this question for the Indian Government, my attention was particularly directed to the process employed at one establishment where "fecula" formed one of the principal ingredients for binding the small coal together. On my return home I made some experiments on a small scale, burning my specimen blocks in the different fire-places in my house, and, so far as my observations went, I came to the conclusion that such fuel made less smoke, threw out a greater heat, consumed less rapidly, and made a smaller amount of ashes than coal. Thus it was at the same time both a pleasanter and more economical fuel to burn than coal in its ordinary state. Consequently, I fully anticipate that when its advantages become more generally known the universal employment of patent fuel, excepting, of course, in cases where small coal can now be used, will go far to bring into profitable use that which by its waste may be considered as constituting, at the present time, a great national loss.—*Ealing, Nov. 15.* FRED. C. DANVERS.

RATING OF MINE DUES.

SIR,—The courts of law long since determined that mine dues, when reserved in kind, are proper subjects of rating, and that the lords are liable to be rated in respect of them. Afterwards, by an ingenious device to escape this liability, the value of an equivalent proportion of the minerals was reserved in money instead of in kind, and the courts, rewarding the ingenious device by an ingenious subtlety, held that dues so reserved were no longer rateable. This has been felt, and is generally admitted, to be a great hardship. Had the dues continued to be rateable, no one could fairly complain.

Looking back over my papers, I see it is now nearly 16 years since this grievance was considered by a parliamentary committee, and also seriously discussed in Cornwall. It was then very generally agreed that if the legal subtlety by which dues obtain exemption from rating were reversed, practical justice would be done, and that our county members should bring in a Bill to effect this object. Sketches or draughts of such a Bill were prepared by certain gentlemen who were considered competent thereto. Then came political disturbances and a dissolution of Parliament, and the matter went into the limbo of proposals laid aside for a more convenient season. Meanwhile we have been amused with promised imperial legislation on the whole subject of rating, which would include this with many other matters requiring a remedy. Amateur legislators have also been trying their hands upon measures on this subject, fraught with the greatest injury to our mining industry, which have necessitated great exertions on our part in Cornwall to prevent their becoming law.

It is now four or five years since (time flies, and this matter has been so long in hand that a year or two up or down is not much) a county meeting was held in Cornwall, and resolutions were unanimously passed, which I think met with general approval throughout the county (including most of the boards of guardians), as also in the mining districts of Devon. Substantially it was then agreed that dues ought to be rateable whether reserved in money or in kind, and that where, under existing sets, all rates are made payable by the miners, it would be the fairest thing during the currency of such existing sets, to divide the burden equally between the lords and adventurers, leaving them free to make any new arrangements when the existing sets should expire. A county committee was appointed, and it was understood that a short Bill would be brought into Parliament for the above-mentioned objects, irrespective of any probable or possible measure of general legislation on the law of rating.

Since then we have, year by year, waited on the promise that a general Government Bill would deal with the matter, and have been told that any special legislation to remedy this particular matter could not be attempted. It is unnecessary to state the result. Up

to this time "nothing." The Government Rating Bill of last session provoked general opposition, and was withdrawn almost as soon as introduced. What guarantee have we against a similar result next session? Meanwhile no attempt is made to remedy what, in Cornwall at least, is admitted to be anomalous and unfair, and as to which miners, agriculturists, and landowners have all agreed.

Why not introduce a short Bill to declare that dues shall be rateable when reserved in money as they are when reserved in kind? I venture to append, for the consideration of those interested, an outline of a short Bill limited to this object. It is pretty certain that any Government Bill on the general subject of rating will have to encounter opposition and delays, and we have also to fear that in dealing with the subject of mines it may treat them as was done by the Bill of last session, and so compel us to oppose by all means in our power. A short Bill to remedy an admitted anomaly, and which would simply seek to restore the law as it stood before the cases of "King v. Tremayne," &c., would redeem pledges given to the county of Cornwall, and entitle the miners when their interests are again threatened to apply to their agricultural friends and neighbours to aid them in protecting themselves against injustice. R. W. CHILDS.

A BILL TO AMEND THE LAW RESPECTING THE RATING OF MINE DUES IN ENGLAND AND WALES.

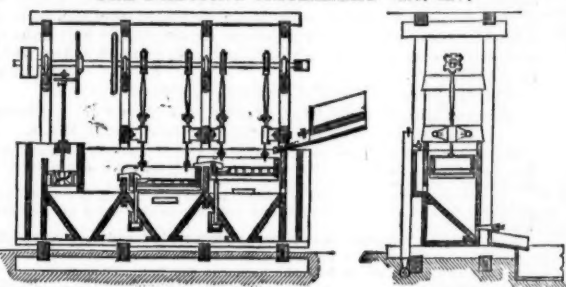
Whereas persons to whom dues are reserved under any lease or grant of license for the working of mines and minerals in England and Wales (other than coal mines) are now liable to be rated to the relief of the poor, and other local rates, when any proportion of the minerals is reserved to be rendered in kind, but have been held not liable to be rated where there is reserved upon such leases or grants merely the equivalent part of the money value of the minerals when raised and made merchantable, or sold, or contracted to be sold, or a sum of money to be paid in respect of such minerals, or a fixed portion of such minerals as may be raised thereunder, and it is expedient that such distinctions should be abolished. Be it, therefore, enacted, &c., as follows:—

1.—From and after the day of next the persons to whom dues are, or shall be, reserved and made payable under any lease of, or grant of license, for working mines in England and Wales (other than coal mines), shall be rateable to the relief of the poor in respect of such dues where such dues are reserved or made payable in money, or a money value, in like manner, and to the same extent, as they would have been rateable under a reservation of an equivalent part of the minerals in kind.

2.—Where under any existing lease, or grant, persons will become rateable in respect of dues under this Act, who were not rateable at the time of the passing thereof, and where by the terms of any existing lease, or grant, reserving such dues, all rates are payable by the grantee, or grantees, the grantor, or grantors, or any person, or persons, claiming under him, or them, shall be entitled, during the term thereby granted, to receive and recover from the grantee, or grantees, or any person, or persons, claiming under him, or them, and liable to perform the covenants and agreements of the same lease, or grant, under and by virtue of such covenants and agreements, one moiety of the sums from time to time assessed upon and paid by such grantor, or grantors, in respect of rates on the dues for which they are hereby made rateable; but such grantee, or grantees, or any person, or persons, claiming under him, or them, shall not be liable to make any further payment in respect thereof, notwithstanding any covenant in any such lease, or grant, contained to the contrary.

3.—This Act may be cited as the "Mine Dues Rating Act, 18."

ORE DRESSING MACHINERY—No. XV.



RITTINGER'S SIEVE JIGGER.—This continuous jigger, shown in longitudinal and transverse sections, Figs. 1 and 2, is constructed on the principle of the ordinary lever machine, separation of the ore grains being effected by moving the sieve in a hutch partly filled with water. In order to produce a continuous delivery of sand and ore, the rear end of the first sieve is formed so as to overlap the end of the second sieve, a tube being inserted in the bottom of each sieve for the purpose of carrying off ore and ore stuff. As in all continuous jigging arrangements, whilst the separation of the particles is mostly effected by the stroke, their movement, from the line of ingress to the discharging points, is produced by a flowing current of water. The length of Rittinger's sieve is 36 in., width 15 in. Each sieve bottom is fixed on a wooden grid, in such a way as to be readily detached from the frame. The side rods are attached to sweep rods connected with eccentrics. In order to prevent the upward passage of water between the sieve frame and sides of the hutch, a strip of leather, 3 in. wide, is fastened to the former and pressed against the latter by the downward action of the stroke. The second sieve discharges its sand into a funnel-shaped box, the bottom of which is pierced for the reception of a hollow plug.

This box is also partially divided for a water-circulating screw, the screw itself being rotated by means of friction gear, fixed on the driving and the screw shaft. The water canal extends behind the sieves, and communicates with the sieve-boxes by means of rectangular-shaped openings. This kind of sieve jigger is not suitable for treating stuff varying in size from 0 to 2 millimetres. Sand of 2 millimetre grains required 3 cubic feet of water per minute, and 120 strokes $\frac{1}{2}$ in. in length in the same time. The quantity of sand worked was 30 cubic feet per hour. For grains of 4 millimetres in diameter $\frac{3}{4}$ cubic feet of water was necessary, also 130 $\frac{1}{2}$ -inch strokes per minute. For sand composed of 8 millimetre grains, $\frac{4}{5}$ cubic feet of water, and 160 $\frac{1}{2}$ -in. strokes per minute was required, the result being 32 cubic feet of sand worked per hour. Altogether, this form of jigger does not appear to afford the same satisfactory duty as that obtained from piston plunger jiggers, whilst it requires to be driven at a higher speed, and with a shorter length of stroke. 2, Coleman-street-buildings, London. JOHN DARLINGTON.

PRACTICAL MINING—TRIBUTORS' ORES.

SIR,—Considering the basis upon which the tributors' ores have been received from them, there is nothing whatever to justify the assumption that the mixed parcel is a 6 per cent. ore. Assuming the assay of each tributors' ore to be correct, it is obvious that if the smelters were paying the price "B. S." states for 6 per cent. ore, the price paid for the mixed parcel was too low. If, on the other hand, the mixed parcel was really only 6 per cent. ore, the produces stated for each tributors' ore are too high, or the mixture would give 6 per cent.; this is an indisputable truth, and, therefore, need not be further referred to. I cannot assist "B. S." to settle for ore (purchased as 6 $\frac{1}{2}$ per cent. ore) upon the basis of 6 per cent., but I may tell him that (using the same tables that give the close approach to accuracy upon calculating the ore at its proper produce) starting from 6 per cent., and deducting the poundage according to his method, which is the Cornish miners' method also, the result is not the same, and that the more valuable a tributors' lot may be the more that tributors lose.

I think "B. S." will at once admit that tributors should be as justly dealt with by mine agents as the mine agents are dealt with by the smelters. The smelter considers the value of each parcel purchased upon its own merits, and not upon the assay of ore he has purchased from another agent, so each tributors' ore must be paid for upon its own assay, because the transaction is between the tributor and the

agent. The bargain made between the agent and the smelter has nothing to do with the tributer, except as to the gross amount received from the smelter for the mixed parcel.

The system of distribution advocated by "B. S." is open to much abuse, because it gives an unfair advantage to low produce ore, so that if tributaries raising 6, 7, and 8 produce ores have those ores mixed with low produce ores they lose. Suppose an agent is raising a mass of poor ore (say, 3 or 3½ produce) on outwork, and this ore is sold with the tributaries' ores of 6, 7, and 8 per cent. the difference to the tributaries will sometimes be equal to 10s. per month, and the agent gets the credit of doing better than he really is with his outwork bargains. Some of the more intelligent tributaries have long been alive to this, and, therefore, stipulate to have their ore sold as a separate parcel, but if the distribution be made on the basis of the assays of the tributaries' ores no such injustice results. Perhaps "B. S." will state in his next whether he considers my distribution of proceeds more equitable than that which he first indicated, and likewise whether he is accustomed by any other system to obtain (upon a similar parcel) a result, at first trial, within 5s. of absolute accuracy. Whenever "B. S." again sells a mixed parcel I will undertake (if he will sell dry weight, and produce of each tributer's ore, and gross amount received for the mixed parcel) to give him an equally satisfactory division in the *Mining Journal* next published. Nov. 21.

GLAMORGANSHIRE MINING COMPANY.

SIR,—In a paragraph in the *Journal* of Nov. 14, referring to this company, you call attention to the advantage of the stream of water which flows near the intended workings. I, therefore, enclose a correspondence which has taken place on this subject for publication, for I conceive it to be but fair that the intentions of those interested in the stream should be known. J. G. PALLIN, *Tredgar Estate Office, Newport, Nov. 21.*

Newport, Monmouthshire, Oct. 9, 1871.
SIR,—I am informed that you in conjunction with Mr. Charles Thomas, have obtained, through Mr. Foster Brown, a license to search for lead ore in Rhyl-gwyn and Ruddy, in the county of Glamorgan, and that you purpose washing the ore by means of the Drathin brook.
As Lord Tredgar's agent, I deem it my duty to tell you that the village of Drathin is his lordship's property, and the inhabitants use the water of that brook for all household purposes, and that if the washings of lead ore or other mineral water be emptied therein the water will be rendered wholly unfit for such purposes.
If, therefore, I find you or those employed by you injuring the water in the way named it will be my duty, on behalf of his lordship and his tenants, to apply for an injunction to restrain you from so doing.
Mr. Peter Tenby, St. Neot, Cornwall.

HENRY JOHN DAVIS,

Hobbs's Hill Mine, St. Neot, Oct. 11, 1871.
SIR,—Yours to hand. We do not wish by any means to interfere with any brook or lands belonging to Lord Tredgar without his permission. We have only the right of the water passing through our mine setts. I am quite a stranger to the district, and know nothing of the water-courses. Before we make use of any water we must have a right understanding about it, and I will call at your office for information. I should be very sorry to do anything wrong. I shall be at the mine on Saturday, and will look it over.
Mr. Davis.

P. TENBY.

CRESCENT QUARTZ GOLD MINE, CALIFORNIA.

SIR,—I beg to enclose an abstract, embodying the more prominent features of the Gold Crescent Mine, the examination of which through its several levels was made by the engineer appointed by me, as President of the Mining Bureau, in my presence, and under my superintendence. A full report upon that property, endorsed by the Bureau, has been forwarded to the interested parties in London by the agent in Francisco, who applied to me for the examination by the Mining Bureau of the said property.

A number of Utah miners have applied to us for establishing there a Mining Bureau, in consequence of the confusion and mining excitement which exists in that locality; but the appearance of a Mining Bureau there will soon settle things to the satisfaction of honest miners. I will post you on our movements in Salt Lake City, and will communicate with you from there, where I expect to be in about ten days. J. BERTON, *Mining Bureau of the Pacific Coast, Sacramento, Oct. 29.*

Crescent Quartz Gold Mine, situated in Indian Valley, Plumas County, known on the Official Map as Crescent Mines.
There are four lodes or veins belonging to and in possession of the Crescent Mining Company, called the Horseshoe Mine or lode, the Union Mine or lode, the Crescent Mine or lode, and the Pet Mine or lode.
The principal working shaft is known as Pearl's Shaft; it has a depth of about 250 ft., and is well timbered and secured, having good ladders for the whole distance.
Amount of bullion taken from mine, as per records found..... \$354,414 3
The first work upon the mine was done in the summer of 1862.
From that time up to 1867 the books of the company show a gross yield of \$667,213 59
From June, 1867, to January, 1869, there seems to be no record as to the amount of bullion taken from the mine.
From January, 1869, to Sept. 23, 1870 (a period of 21 months), there have been taken out from the mine 197,201 75
Total \$551,614 34

As to the amount of quartz treated only an approximate estimate can be made, as everything that was taken from the different lodes seems to have passed through the batteries—neither was the rock assorted in any manner, taking the good with the bad.
BUILDINGS.—1 store; 1 powder house; 1 barn; 2 blacksmiths' shops; 1 boarding house, with brick basement; 1 store house; 1 coal house; 25 other buildings; 1 steam mill, 32 stamps, good building; 1 steam hoisting works. Water: this they have in sufficient quantity, and it is brought by a ditch and pipes from a never-failing spring, situated on the side of the mountain, 10 miles from the mine. The veins of quartz in this mine have generally a width of 6, 10, 12, and 15 feet. At the junction of the Union with the Crescent it forms a large body of quartz. Wood: Plenty within half-a-mile of mine—price delivered at mine cut and hauled, @ 2½ per cord.

[TRANSLATION.]

THE GRAND DUCHY OF LUXEMBURG, AND THE CHARLEROI METALLURGISTS.

SIR,—Your estimable *Journal* has more than once directed the attention of its readers to a question of paramount importance for the future of the metallurgical industry of Belgium—that of the establishment of a railway destined to bring to our producers the ores of the Grand Duchy of Luxembourg upon advantageous terms, or, at least, upon more advantageous terms than those at present offered by the Grand Luxembourg Railway Company. This question has just been agitated in a solemn audience granted by our ministers to a deputation of industrialists from all parts of Belgium.

We have the honour to send you the exact and complete text of the interpellation which has been made to the Government upon this subject, as well as of the answer given by Mr. D'Anethan, Minister of Foreign Affairs, and President of the Council of Ministers. We should be happy to see in your estimable *Journal*, the value of which is highly appreciated in our country, what has been said and declared at the ministerial audience concerning a question which we repeat has become a vital question for our national metallurgical industry.

Veuilleux ager, &c.,

For the Association of Ironmasters of Charleroi, DELACOUR, Secretary.

[Enclosure.]—In the audience granted by the Ministers of Foreign Affairs and of Public Works to the delegate of the Chamber of Commerce and Industrial Association of the country the question of the Athens and Charleroi Railway has been considered, and we subjoin the address of the President of the Ironmasters of Charleroi, and the reply which has been given to it:—

Mr. SMITH: Some days after the first meeting of delegates, at the Hotel de Suède, the Association of Ironmasters of Charleroi met, and charged me to request the Government to give a solution to the question of the railway destined to put the mines of the Grand Duchy in direct connection with the blast-furnaces of our district. You know, gentlemen, the present state of affairs: the Grand-ducal smelting-works, and those of the basin of Longwy, are stopped for want of coke; ours, badly supplied with ores, are menaced with the same danger. Our apprehensions increase as we approach a season during which transports are always difficult. The Luxembourg is absolutely incapable of doing justice to our wants; its materials in waggons and locomotives is insufficient, its line is almost all single, and the gradients are very unfavourable. We know that the Government has been in negotiation with the Luxembourg Company for the re-purchase of the line, but we are assured that the purchasers have had to be broken off in consequence of the exorbitant pretensions of the shareholders. Such a state of things might continue indefinitely, and we ask what prevents the Government from itself fixing the purchase price, and assigning the company a certain time for acceptance, stipulating that in case of refusal a new line will be conceded. The re-taking of the Luxembourg line by the State would remove a part of the inconveniences to which I have referred, but would not completely satisfy the industries of Charleroi, of the Centre, and of Mons; nevertheless, we recognise that it is materially improve, and without further delay, their conditions of existence. Ores and fuel are at present charged 8-5 centimes per ton per kilometre; if the line becomes the property of the State this figure would be reduced to 3-5 centimes. Nor is this the lowest price to be anticipated, and it will be necessary, in order that we may meet the dangerous

competition of our neighbours, that we should at no distant date have a still lower tariff. This seems to us less difficult of attainment when we see at our frontiers the Eastern Railway of France carry the ores of Moselle to the iron-works of the Nord, department of the Nord, at the rate of 2-25 centimes per ton per mile; while other French lines, that from Verviers to Montignoul, for example, have been able to fix their tariff at 1-75 centimes. However, gentlemen, I repeat that the re-taking of the Luxembourg line by the State commands the attention of the industrialists of our district, and they would see with gratitude the Government carry out, without delay, the realisation of this project.

Mr. D'ANETHAN (Minister of Foreign Affairs): As to the line from Athus to Givet we have already had the pleasure of indicating the position of affairs. Mr. Smith believes that the *pourparlers* are broken off between the State and the Grand Luxembourg Company. They are not broken off, however, although I desire to say nothing about them. It would be imprudent to indicate the position we are in at the present moment, and to say how we induce this company to give us reasonable conditions, but we shall try to arrange to satisfy the interests of Charleroi. It is not alone with the Grand Luxembourg that we deal, but with connection of all the mines with the Athus station, and of numerous lines to be constructed, for which we are in negotiation with the Grand Ducal Government and the Grand Luxembourg Company. These negotiations are not isolated, and they relate also to the eventual re-taking of the part of the William-Luxembourg line, situated on the Belgian territory. These negotiations are progressing, they are carried on with great solicitude, but must be conducted with prudence, in consequence of questions raised as to the working of the William-Luxembourg itself. I beg you to have confidence in the Government and in its solicitude. I hope that we shall arrive at a result that will satisfy all the interests involved.

ON THE FORMATION OF MINERAL IN VEINS.

SIR,—As a long correspondence has taken place in the *Journal* relative to the strata surrounding rich veins and the component parts without, in my opinion, having led to any acts to enlighten us, it has occurred to me, and I have no doubt to many other mining agents, that a discussion on this subject, however protracted, would lead to no decisive result, and that, in fact, we should not be much more enlightened on the matter than we are at present. I had not intended to have written about it again, but seeing, in the Supplement to last week's *Journal*, a letter from Mr. George Evans has induced me to offer a few remarks on the above heading. Mr. Evans believes that "as it was in the beginning, it is now;" but when that beginning was the earth and all things connected therewith was in a very different state to what we find it at present. We have been told that "the earth was without form, and void." From this state there can be little doubt to any and every unbiased mind the world has undergone and is now undergoing great changes. Look at, for instance, in our own time, the great masses of mountains that have been removed in Mexico, valleys filled up, &c., where the gases existing for thousands of years have at last found an outlet.

There is no doubt on my mind that the formation of minerals is continually going on. I have seen a vein where the lead ore has been only taken away for fifteen or twenty years where the carbonate of lead has sprung out of the levels like young trees, for 3 in. or 4 in. in length. I quite agree with Mr. Evans that the water contained in the veins would be likely to give a more satisfactory solution than the analysis of the strata, believing that in such water there may be a very great quantity of mineral. We will suppose, for instance, that we have a great course of black copper ore existing in an east and west vein, and held or placed between two north and south lodes. It is very possible that that course of ore may remain for any length of time as it was, but break through one of those cross-courses, and let the water of the east and west lode have free vent, passing through your black ore, and what becomes of it? Why it vanishes, and perhaps finds its way to another place, where it is again pent up, and from the causes of the necessary elements for again depositing copper you would have it in another place, and in another form; and even with the small excavations carried on continually by manual exertions alone, a cause or an effect may be and is possibly produced that we have not, nor perhaps never may have, the slightest conception of. This brings me to the object I had at first in sending you these few hurried remarks. In whatever district it has yet been my lot to travel over, wherever you find great deposits of minerals and metals you will find a great number of lodes or veins, and almost at all angles. If the lodes are east and west you will generally find that they are intersected with cross lodes at nearly right angles, or you will find veins running counter to them, and forming junctions with them, and, in fact, veins continually falling in with and then diverging from each other.

Since I was ten years old, and had to traverse some deep mines with my father in the county of Cornwall, up to the present time, upon duly considering and studying the lodes or veins, with the cross veins, their junctions, and dipping into lodes, I have never seen one great or even little course of ore that might not be accounted for. With proper attention to this, together with the magnetic currents, the most powerful of which we might take to be the earth's shifting, or from 22° to the east, and the same number of degrees to the west if true north, and having found one productive vein, I should go as far east and west, provided the mineral was in a productive vein in the direction indicated, to find a deposit of mineral in another lode or lodes. Whenever the deposit of minerals begins to fall off you will find for some distance eastward and westward, as the case may be, a piece of comparatively poor ground, and this will continue until it has had a sufficient space afforded for the deposit of another bunch. To make this matter plain a great many illustrations might be shown where the junctions of lodes have made immense deposits of ore, and without these junctions of lodes and cross lodes the cases of their doing so I am convinced would be few and far between. Having some time since written a series of letters on the junction of lodes, &c., they might serve to illustrate my meaning more properly than I have been enabled to express it. I would remark, therefore, in order to find great and good deposits of minerals that the chief point of study amongst practical miners and agents should be the situation of the vein in regard to any productive mines in its vicinity, what lodes or cross lodes traverse the set, and whether these junctions in other properties opened have enriched or detracted from the lodes, and to expect under ordinary circumstances the same result.

I might instance cases of rich mines occurring under such circumstances, and before finishing will give you—Trenow Consols, first to the south; Wheal Neptune, second to the south; Wheal Caroline, third; Owen Veat, fourth; Trevabyn and Gear, fifth—this mine is now to be worked under the appellation of Wheal Henry, and will undoubtedly prove a very valuable mine. Wheal Friendship to the north. These are in the West of Cornwall.

Take, again, the Lisburne Mines, and run your lines as indicated you will have—Glogfawr, first south; Glogfach, second; Logylas, third; Frongoch, fourth; Rhedol United, fifth. These mines are now to be opened on a proper scale, and will prove the greatest yet opened in this county. There are no less than seven distinct veins in the grant, and with such junctions that cannot fail to produce an immense quantity of minerals when worked with spirit. Goginan, sixth; Cwm Erfin, seventh; East Darren, eighth; and Allt-y-Crib, to the north, the ninth, and last. ABSALOM FRANCIS, *Goginan, Aberystwyth, Nov. 20.*

P.S.—Allow me to thank an unknown friend for forwarding me the Report of the British Association for the Advancement of Science for 1869.

RHODESMOR MINE, AND ITS MANAGEMENT.

SIR,—Allow me, through the medium of the *Journal*, to call attention to the very unsatisfactory manner in which affairs at this mine are conducted. We have subscribed our capital twice over, and, judging from the rate we are going at present, there is every probability of our having to subscribe it once again, as the last two summers have passed over without anything being done towards opening out the mine, which is, I am informed and believe, both very valuable and easy enough to work if gone into with spirit at the proper season of the year. Instead, however, of this being done, one-half of the wet season is spent in futile endeavours to pump the mine dry, and the other half in doing apparently nothing at all, if we except the occasional trips to the mine to which the directors treat themselves. Then, Sir, during the dry season, when the mine could be drained quickly and at small cost, the time is spent in such work as polishing the engines (this is a high important work being done, I believe, under the special superintendence of the engineering section of the directors), repairing boilers, and generally preparing the machinery for work, this being just completed by the time the wet season comes on again. The engines are then started, and in trying to get out the large accumulation of water are worked at such a speed that they very soon knock themselves to pieces again, and, without having done a bit of good are again stopped for the next few months. It is useless asking the agent at the mine to do as his neighbours do, and furnish us with an occasional report in the *Journal*, as such proceedings, as these would not read well week after week—in fact, he did send one some short time since, but as everything is in exactly the same position now as then, and likely to be for some months yet, the only thing they can say is the usual set phrase, "No change since my last report." I have searched the *Journal* weekly, expecting

to find a report of the proceedings at the last annual meeting, as I understand one gentleman, in a very eloquent speech, introduced a new plan for making the fortunes of the Rhodemor shareholders, which said plan amounted to this—"Go and spend as much money in the mine (not the Van), and your fortunes are made." No report having appeared, I presume the directors do not wish publicity given to the proceedings. SHAREHOLDER.

PRINCE OF WALES MINING COMPANY.

SIR,—Just before the last meeting of shareholders was held I asked the managing authorities, through the *Journal*, how it was we never saw any account in the weekly reports of the further sinking of the shaft? The answer the Chairman at the meeting gave was that there was not as yet sufficient ventilation in the levels then being driven to resume sinking. Now, Sir, putting aside the length of time before last meeting during which we never found out the meeting it is time something was done in that way, if they ever intend to make Prince of Wales once more a dividend-paying concern, as other mines have been made, through sinking rapidly, and opening deeper levels on the course of the lode. I hope either the shareholders or the managing men will see that the interests of the shareholders are studied a little more. I have the best authority for saying there is every indication of a good line mine being opened out if they will only go deeper for it. Then why not do so? As it is the manager seems to be only pressed with the idea that he is opening out the mine in a first-class manner, by driving a level or two, and scratching or stopping away the ore already discovered. I would here respectfully ask Mr. John Hitchen whether his great experience does not teach him that the prices of our mining world have been discovered only by rapidly sinking and opening out the deep levels. I have no doubt the other non-professional members of this company are of my opinion in this respect, and I should like to see a reply from some of them in your columns, as they must have been watching the mine lately and the conduct of their directors; and explanation from whom, in some shape or other, would greatly oblige— A SHAREHOLDER.

SOUTH CARN BREA.

SIR,—I noticed, in the Supplement to last week's *Journal*, an article relating to South Carn Brea, and which I consider a very correct statement as to the locality, &c., of the mine. Evidently the writer knows of the riches that have been, and are also now, in existence surrounding the Carn Brea old hill. I can, however, tell your correspondent a little more about South Carn Brea Mine. Independently of that splendid piece of virgin ground running east to Wheal Uboundary, and standing high and dry for over 100 fms. in length, are some 400 fms. to the west of nearly unwrought lode, and for which the mine at the last working was set in motion upon the 1st of June 1869, under the old company, and so I am now, and I mean to say there were many hundreds of fathoms of that great and strong tin lode that will pay well to take away; and upon this immense amount of tin ground laid open did Capt. Roberts and Dawe recommend the erection of all their stamping machinery, &c. Their report stated that all the lode would pay well to take away, with tin as it was then—some 65s. per ton. Besides this, in sinking South Carn Brea some 50 fms. more you enter the junction of kilias and granite, and about which place North Basset main lode and South Carn Brea great lode fall in with each other. This is a point that should be hastened to accomplish. The result of the junction must assuredly be one of great riches. South Carn Brea I look upon, in the course of some two years, to be one of the best and most remunerative mines in the Redruth and Camborne district. MINING TOURIST.

FRANCO CONSOLS, AND EAST LLANGYNOG.

SIR,—The captain of Franco Consols persistently withholds from the readers of the *Journal* a report touching the value per fathom and the position of the great discovery of copper ore, of which such a fuss was made some months ago. The discovery has yielded little fruit—a small parcel, some 12 tons, of very low price ore is, I believe, the result since the important telegram reached the London office. Let the captain of Franco Consols transmit for insertion in the *Mining Journal* an honest, straightforward, and accurate giving the actual state of the several ends of ground, &c., and their respective values per fathom. We shall then be able to determine whether the present price of shares announced is a fictitious quotation in regard to the worth of the mine or a reality. Also, will the captain of the East Llangynog Mine favour us with a detailed report of the state of things underground? East Llangynog has of late been conspicuous amongst the reported mines in the *Journal* by its absence. A mine whose latent value is appraised by interested parties at the enormous sum of £100,000 should announce frequent sales of lead ore and regular dividends. I reiterate my previous assertion, "In the published reports there is nothing to warrant the price asked for these shares"—absolutely £50,000. for the mine over the present market value of Devon Great Consols. DEVONSHIRE.

EAST LLANGYNOG MINE.

SIR,—As certain exaggerated statements regarding this mine are being put forward in "Private Circulars," recommending the purchase of shares on the promise of a dividend in January next, I think in the interests of mining, and for the benefit of all concerned, it is only just that the absurdity of such promises should be exposed. No doubt the management, whom I believe to be respectable, are unacquainted with the issuers of these "Circulars," and, therefore, cannot be held responsible for statements made by such individuals, otherwise I should think they would at once give me a public contradiction. There is nothing more injurious to a mining property than false and delusive reports, made for the purpose of palming off shares at high figures, for when the discovery of the deception takes place holders become disgusted, and shares are forced on the market, and sold at as many shillings as pounds are now asked for them. A difficulty is then experienced by the directors in collecting the calls that are (and by this company will be) required for the proper development of the mine. As the directors will probably not hold their general meeting, to produce to the shareholders a first balance-sheet, for at least two or three months to come, it is as well that the public should be made acquainted with the probable position in which they will then find affairs to stand. This company was started in December, 1870, in 50,000 shares of 2s., each—30,000 shares fully paid and 20,000 shares having 3s. credited on each, amounting together to £50,000, which sum constituted the purchase-money of the property, leaving 10s. per share on 20,000 shares, or £20,000, as reserve fund for working capital: 5s. per share, equal to £50,000, has already been called. The last call of 2s. per share was made on September 1, 1871, and another must soon be made to provide for the current costs of the mine, as the sale of ore since the formation of the company has been but 40 tons, realising about £500. Although it is stated that they have about 30 tons ready for the market, yet, supposing such should be true, it needs but very little calculation to arrive at the fact that to pay a dividend of 5 per cent. on 50,000 shares, except out of capital, a sale of 50 tons of ore will require to be made. How and when this is to be accomplished are questions upon which information will be acceptable. SECRETATOR.

"MURCHISON V. BATTERS."

SIR,—With reference to the short statement in the *Journal* of last Saturday that the bill in "Murchison v. Batters" was dismissed, but without stating what the bill was, I think it is only just that the plaintiff's bill was dismissed, and that my client had no opportunity of discussing or answering the points upon which the learned Vice-Chancellor, upon hearing only the plaintiff's case argued, thought fit to refuse costs. It is of the more importance to my client that your readers should understand this, as he has no opportunity of appealing to a higher court on the point, the rule being that no appeal lies on a mere question of costs. THE DEFENDANT'S SOLICITOR.

MINING MAPS.

SIR,—My attention has been called to an advertisement in the *Mining Journal*, offering the maps published by me at half-price. Those gentlemen who have recently purchased of me at the original price will be greatly disappointed. I beg to inform them and the public that the advertisement is not mine nor authorised by me, but must be that of a gentleman who took a lot of maps of my sale at the full price, on account of some business transactions. K. SYMONS, *Truro, Nov. 20.*

THE EMMA MINING COMPANY.

SIR,—Why during the past week some of the daily papers, and amongst them the *Daily Telegraph*, should have fixed upon the prospectus of the Emma Silver Mining Company (Limited) as a flagrant example of what can be done in the way of holding out false hopes to unwary investors I am at a loss to imagine, seeing that of all the mines lately brought out in the Western States of America the Emma is pre-eminently the best, and has been, and still is, turning out enormous quantities of valuable ore. People who, like the writers of smart leaders in the daily papers, slash away without regard to merit, ought to make enquiries before they commit themselves to the invidious task of warning the public against a particular mine. But when they do this latter they must be prepared to substantiate their pointed innuendoes, or run the risk of being accused of acting an interested part. To show how confident competent judges are as to the large quantities of ore coming forward from the Emma, and the permanence of the yield, I may mention that a large smelter at Swansea has recently built extensive works, and that they are expressly for the purpose of smelting the peculiar ore from this mine, and, I understand, has made contracts for a large supply of ore from the Emma. The fact that one of the largest ore-breakers in Swansea, who has inspected the mine, has taken a considerable interest in it, is, at least, in regard to the merits of the mine itself. However this may be, Sir, upon whose report the value of the mine may be estimated, is, at all events, a suspension, and his name a sure guarantee of the soundness of the prospectus. Taking everything into consideration, I can only come to the conclusion that these adverse rumours originate from malice, or, perhaps, from "bears." Nov. 23. A CONFIDENT SHAREHOLDER.

[For remainder of Original Correspondence see to-day's *Journal*.]

SMOKE-PREVENTING FURNACE.—In the invention of Messrs. HYDES and BENNETT, of Sheffield, for improvements in the construction of furnaces for preventing or lessening smoke, and effecting more perfect combustion of the fuel employed therein, the features of novelty consist, first, in making of the fire-bars of furnaces self-sustaining, by forming them of heating surface which fixed bearers are dispensed with, a larger amount of heating surface than obtained, and also a greater body of fire. Another feature of novelty in this invention consists in adapting a fan-shaped piece of metal to the end of a steam-pipe, when employed in furnaces to increase the draught therefrom, and the purpose of distributing or infinitely dividing the particles of steam, and diffusing them more generally and uniformly over the surface of the fire.

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE II.—I placed before you yesterday (said Mr. Smyth) a few of the preliminary matters which have to be taken into consideration before the commencement of mining operations, and there is only one other point I would add to them. I said that in most countries now-a-days, instead of adventurers making isolated efforts confined to a few feet of ground, associations of persons are now common, commanding a larger capital, and, therefore, able to work a large area simultaneously. It is, however, a preliminary of great importance that care should be taken to secure an area sufficiently large for the enterprise to have the full benefit of its expenditure in opening the ground to be worked. Indeed, in some districts, and particularly in some of the limestone formations, where the water is apt to percolate through the lower beds towards any vacant space or opening, if a mine were commenced on too limited an area the adventurers would have to expend a large sum of money for pumping machinery, which, when at work, would benefit their neighbours as much as themselves. In many parts of the country, it is extremely important not to lose sight of this fact. Another important preliminary is to settle the proportion to be paid to the owner of the minerals, and to the Crown or ruling power (whatever the form of Government might be), for permission to work for a given time. In the case of certain despotic countries in Asia—and I might say certain countries in Great Britain—there is an idea that they have only to ask as much as they please and it will be yielded to them; in fact, that a mine is so profitable a concern that it is capable of bearing any amount of burden in the shape of royalty. The more the matter is looked into, however, the more plainly it will be seen that a reasonable proportion must be exacted from the mining adventurer. Where the "dish," or lord's dues, used to be one-tenth, or a little, it was long ago conceded that as the mines increase in depth expenses multiply, and the royalty must be lowered considerably, so a fifteenth became a much more usual proportion. There are, no doubt, isolated cases where from a fifth to a seventh of the whole profits are paid for permission to work; and in other cases a certain amount is paid down beforehand—that is to say, for spending your money in a purely speculative enterprise, which may, perchance, prove wholly unproductive. In the last few years mines have had to be increased so much in depth, and the prices of metals have been so low, that the dues have fallen to one-twentieth; and when unusual difficulties occur the dues or royalties are reduced to a nominal proportion (a fortieth, fiftieth, or sixtieth part) until the difficulties are got over. It is, of course, extremely important in adverse times that miners should feel that the lord or the lessors are sympathizing with them, and particularly when they are engaged in works of a praiseworthy character, such, for instance, as sinking additional shafts for ventilation, or other improvements, whether above ground or below. In foreign countries, where (as I have already mentioned) the entire right is vested in the Crown, the conditions are more favourable to the miner than they can be in this country, or any other where the rights of ownership are in so many hands. Cases not unfrequently occur where the owners of fields adjoining each other are not at the same time ready to dispose of their mineral interest, and the rights of one may be interested by the other, who, however, is sometimes willing to permit the adventurer to pass under his land for a payment frequently exorbitant. When portions left like this are small there is a risk of their being forgotten, and altogether lost; whereas if the whole were at once in the hands of the adventurers the whole area would be worked, and these portions got with the rest. Then, again, in some foreign countries, the payments being only a small matter, it has been found to answer the purpose of Government to lower these dues as much as possible, and so in North Germany, where the obligation for dues used to be extremely onerous, they are now only 2 per cent. of the quantity raised. In France and Italy, instead of large sums being demanded, the practice has long been to take a royalty on the profits made, to which there can be no objection such as that very justly raised to systems under which a certain sum is exacted, whether the mine pays or not. This latter system has mostly been found detrimental to the progress and prosperity of mining wherever it has been tried, and it is not surprising, therefore, that in the present mining speculation without making himself fully acquainted with the legal conditions on which the ground can be held, the area to be worked, the proportion of the produce to be paid as royalty, and the manner in which that is to be paid.

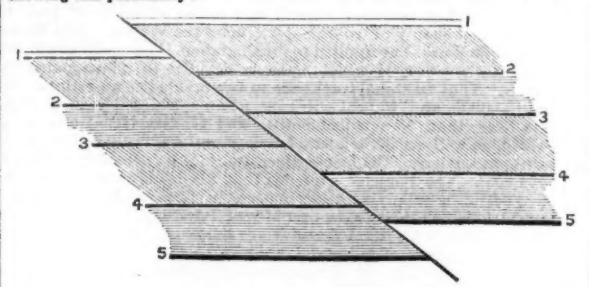
I now pass on to make a few remarks on the natural history of the deposits or repositories from which the minerals are to be obtained; and although a knowledge of geology ought to precede studies of this kind, it may be necessary to pass under review a few facts of a purely geological character with reference to mining, which cannot be possibly done by the geologist, who does not, properly speaking, deal with matters of detail underground. It is desirable that mining students should take due notice of the facts brought under their notice, that they should take them off as exactly as possible, and group together under different heads all those differences and variations from ordinary circumstances revealed by constant daily experience. The miner has, in the first place, to learn a certain series of facts, which will always more or less bear on the success or otherwise of his undertaking. In dealing with the repositories in which the ores and valuable minerals are found. Speaking only for the moment of the stratified rocks, these repositories are termed beds, strata, or layers, and are of two kinds, namely, the primary and the secondary. The primary are those which are deposited directly from the molten state of the earth, and are divided into two great classes. The stratified comprising a series of parallel layers in regular positions, sometimes horizontal, but more or less sloped or inclined, and the unstratified or crystalline rocks. Speaking to-day of the former class only, I may state that they contain certain beds which are distinctly stratified. These strata or beds have clearly been deposited on surfaces more or less horizontal, though they are now found in positions greatly inclined and occasionally vertical, changes which are the evident result of primordial disturbances. The first point connected with these rocks which strikes us is their parallelism. This means that the stratified beds, although differing in thickness, are laid upon each other in a regular sequence. Thus, when a bed of a particular material is known to exist the nature of those above and below it will always be the same. Thus, a bed of black shale overlaid by a yellow substance—say sandstone—associated with coal will unerringly indicate in the same district where the shale and the sandstone are found that the coal is there also. A knowledge of the regular succession of the beds constitutes geological data, which will enable us to deal with a great proportion of all the deposits which are stratified—a knowledge which for the purposes of investigation is of the highest importance. Without this geological knowledge no man is in a condition to make a proper search after minerals in any country. Most of the valuable minerals obtained in England are thus bedded, and their associations being well known certain products are identified with the districts from whence they are obtained. For the last 30 years, for instance, great reliance was placed upon the argillaceous ironstone districts, for that useful metal, but the exigencies of competition, the vast consumption of modern times, and the gradual diminution of the supply, led to search being made in other districts. In this way the great ironstone district of Cleveland in the blue lias formation, and that from the oolitic formation in Northamptonshire, have been developed, and are now of the utmost importance.

(Mr. Smyth then, by means of Mr. Sopwith's models, explained the principles of stratification, and of the parallelism of the beds, and some of the effects produced by alpine disturbances.) These beds, or successive strata (as they are called), will, in determining the character of the district, have to be followed over the country with more or less difficulty, as they may be more or less covered up with sand or soil, or detritus of various kinds; or tilted at a high or at a moderate angle. Referring to a large diagram of an open working at Dale Abbey, in Derbyshire, he pointed out on the perpendicular face of the quarry the successive lines of different thicknesses which represented the ironstone and the beds of worthless material associated with it. The first thing to be done in dealing with these beds is to determine the "dip," or angle of inclination, and "pitch," as it is called in some countries. When the bed deviates from horizontal the part lowest in the earth is called the "dip," and that nearest the

world is that at Duffley, which averages 10 yards in thickness, and in some places is as much as 36 feet. In France there are beds which attain as great a thickness as 60, 80, and in one case 90 feet, but they are almost vertical. Lignite is found in Bohemia and elsewhere on the Continent 80 or 90 feet; and in this country, as at Bovey Tracey, in Devonshire, that substance attains to 20 ft. in thickness. Beds of ironstone are frequently of greater thickness, but the mineral is often deposited in vast nodules, sometimes greatly elongated, so as to resemble regular strata, but yet do not constitute true beds. As regards other kinds of materials the thickness is extremely various. In Thuringia and Prussia copper is found disseminated in specks through beds of slaty stone of considerable extent, with cross bands of metalliferous schist, which are worked, although only a few inches thick.

With reference to these beds, it may be remarked that the researches of geologists are of the greatest use, because the results of their observations show that in all countries we may depend with a wonderful degree of exactness on minerals deposited in this stratified way, although there are so many variations in the thickness of the beds that miners must almost always be prepared for disappointments when dealing with them. Many extraordinary instances might be cited in which fine, well-developed beds have suddenly diminished to mere threads. Another important consideration arises from the change which frequently takes place in the substance and quality of strata. Geologists assert that most of them are deposits of the detritus of rivers or floods. Coal is obviously derived from plants that once grew on the soil where they are accumulated; but there is a greater amount of woody matter thrown down at one place than at another, and the difference of thickness as well as of material are to be found in coal as well as in other beds. The really surprising thing is that tracing the same beds through a large district (say Derbyshire and Yorkshire), they should be found so uniform, although this is a doctrine which must not be pushed too far, for though the beds are identical, it sometimes happens that their value is much lessened by the intrusion of worthless substances. In a bed of coal 10 ft. thick in one of the great mines near Whitehaven, belonging to the Earl of Lonsdale, a little "parting" of white sandstone made its appearance, and gradually came down until it became so very thick as to cause great difficulty in working. The coal having to be got from both sides of it. The colliers are so accustomed to swing their picks into so brittle a material as coal that they objected to hew away the stone, and at last the bed was worked as if it were two different seams, a proceeding so much more expensive as to greatly deprecate the value of the colliery. It is a more common case in a colliery to find that there is a parting at first of moderate thickness, and then a few hundred yards further on it will occupy so large a portion of the seam as to render what is above and below valueless. A very remarkable circumstance of this kind is described by Mr. Jukes, in his work "On the South Staffordshire Coal Field," where a band of stone 30 ft. thick was intruded into the coal. Examples of this kind have been cited over and over again, and yet still require to be cited, as these are things which render unless the best devised plans, or detract greatly from the value of mining property. Sometimes coal itself becomes what is called stoney or pyritic. Similar deterioration takes place in almost every band of stratified material. A notable instance is furnished by the dolomite beds of stone of Permian formation used for building the Houses of Parliament, respecting which a grand mistake was made. Because in a particular place a thoroughly admirable material is found, it does not follow that it will continue equally excellent along the whole line of that bed. It may not vary so far as its chemical ingredients go, but in one place the physical condition may be vastly different from what it is in another. It may be here compact and tough, and there friable and sandy. The stone, in this case, was admirably chosen, but it was overlooked that the beds might not be of the same quality all through the deposit. It is, therefore, wonderful that in the matter of coal they should be so regularly and evenly deposited over a very large tract of ground. Other interruptions are known in the Forest of Dean as "horse." When a foreign body, generally sandstone, is found, the vein is said to "take horse." These masses are sometimes presented first with their larger end, which is called the "horse's head," and the other extremity the "horse's tail." Sometimes these "horses" are of large dimensions, and are very detrimental to the property, for a time, of the enterprise. More important still is that class of difficulty when a vein, or seam, gradually diminishes in thickness until at last no profit whatever is derived from it, and yet it must be followed, as it may be long resume its earlier dimensions. When an interruption is caused by a considerable elevation of the floor, and a corresponding diminution of the valuable material above, it is called the "hog's back."

In some districts the veins, instead of having a regular dip or inclination, are so contorted as to be completely zig zag, and cases are known in which a single shaft has passed through one of these veins in half-a-dozen places. In this country one of the most remarkable contorted veins ever known was that seen in an old copper mine at Ecton. In other cases facilities may be given or withheld by the proximity of other seams. If a section be taken of one portion of the Forest of Dean it will be seen that the beds come within so short a distance of each other that they may be worked together with convenience and profit, but it is often difficult to decide, and particularly when coal and ironstone are both present, whether the one should not be got as an operation successive to the winning of the other. Otherwise it may be better to let down the roof after getting the coal, and then pick out the ironstone, putting props here and there, but both operations should be done within a few hours of each other. One of the greatest hindrances to mining operations, and particularly in some districts, arises from what is called a "slip," or "throw," which simply means a dislocation or displacement of the beds. Things may be going on prosperously, when all at once the workmen come to a mass (say) of igneous rock, mostly of extreme hardness. It arises from there having been a complete shifting of the places of the beds. The one side or other of the parting has slipped down, and the continuation of any particular bed or vein must be sought for higher or lower. As a rule, the movement will have taken place downwards, and if the vein is being worked on the lower level, when the intersecting dyke comes it must be sought for higher up. Supposing A to be the vein, in figure 2, B and C are the intersecting dyke or division, and probably at D there will be found some upward strings or indications to show that the vein is higher up. And so invariably does this hold good that if the movement has been in the other direction it is regarded as entirely exceptional, and called a "reversed fault." It is obvious in the ordinary case that a piece of ground in which the fault occurs loses a portion, larger or smaller, according to the inclination of the "fault," between the two ends of the dislocated vein, but in the case of a "reversed fault" a double quantity of valuable material is gained to the same extent. The following is a diagram, Fig. 3, of the seams at the Clamdown Colliery, showing this peculiarity:—



THE MID-CUMBERLAND MINING COMPANY.

The late Capt. John Vercoe, formerly one of the consulting engineers and afterwards resident manager of the Caldbeck Fells Mining Company, when investigating the neighbouring properties, with a view to further discovery of minerals, had his attention directed to the sets which are now in possession of the above-named company. Having from his own resources made such explorations as satisfied him of the value of the property, he induced several gentlemen to associate themselves with him, and a small company was formed, which has since been carrying on exploratory operations, up to the time of his death under the direction of Capt. Vercoe, and since under that of his son, Mr. W. J. Vercoe, whose report on the present state of the works we subjoin. Several mining engineers of eminence have from time to time visited the mines, and all agree that the Mid-Cumberland (if with spirit developed) will prove a very valuable property:—

"THE MID-CUMBERLAND MINE is a very extensive property, being more than three miles in length from east to west, and one and a half miles from north to south. It is bounded on the east by Drighth Mines, on the south and west by the Caldbeck Fells Mines, and on the north by Red Gill and Brae Fell Mines. Most of the various lodes in the above mines run through this property, and have been opened on at a reasonable depth.

At present there are four points of operation:—1. A cross-cut driving nearly due south from the Long Grain Gill, to intersect a caunter lode (42°) seen only at one point on the Fell, where it was very promising, bearing phosphate and grey lead; this lode will be reached in a few fathoms driving. The main object in continuing this cross-cut is to reach the Caldbeck Fells lodes, having a run of nearly half a mile on their course. In from 40 to 50 fms. driving the first of these lodes—the Silver Gill lode—will be intersected at a good depth, and increasing east to a great extent; 10 fms. further south Dobson's green copper lode, 25 fms. south the north lode, and 15 fms. south the great south lode, all within a distance of 50 fms. The fact that the Caldbeck Fells Mines return over 100 tons of ore per month from these lodes is sufficient to prove the importance of this driving.

2.—A driving near the bottom of Long Grain Gill, with a view of intersecting the new lead lode, as well as the Short Grain lode. The first-mentioned lode is opened to a small extent about 50 fms. further up the Gill, yielding rich stones of blue and coloured lead. The latter seen in the Short Grain Gill, where it has been driven on for a short distance, but was abandoned in consequence of gaining no hold of ground. This lode is from 8 to 10 ft. wide, composed of quartz, prismatic carbonate, phosphate, and blue lead. Enough was seen in this small trial to justify in going for a deeper level in the Long Grain Gill, where a depth of nearly 30 fms. will be attained, so that the worth of these veins will be proved. Looking at the prospects of this driving, and at the fact that the new lead lode is running at an angle of 42°, and the Short Grain lode east and west, there will be a junction of these two lodes, at which point, no doubt, important results will be achieved, seeing that both of these lodes, where opened on, though so shallow, are productive.

3.—The driving of the Ingray Gill lode. This lode has been driven on from 40 to 50 fms., bearing ore at intervals, both blue and coloured. Stones of ore, from 8 to 10 lbs. weight, have been taken from this lode, though only at a depth of 5 fms. A cross-cut, the south side of the Gill, has been started, and the lode is just intersected, and so far as seen, very promising. By continuing this

driving on the course of the lode a great depth will be eventually attained, besides the prospect of cutting other east and west lodes.

4.—The driving on the hanging side of the barytes lode, with the idea of reaching the junction of a large and promising lode, from 8 to 7 ft. wide, about 20 fms. south, with the barytes lode. The barytes lode (from which large quantities of barytes have been taken, and a large supply could still be raised from the shallow workings) is of a very kindly nature, and shows unmistakable signs of a great deposit of lead in depth; in fact, in proceeding (though not having as yet reached the lode) a marked improvement is seen. The junction of these two great lodes is looked to with great interest. By continuing an old driving at the foot of Potts Gill these veins, with the Short Grain lode and the High Pike lode, will be intersected at a depth of nearly 100 fms. Although this at present is not being prosecuted, it will certainly be accomplished at some future period, for the chances of success in such an undertaking are more than ordinary. Besides these points of operation others are equally worthy of development. The Hay Gill lode, from which copper has been sold amounting to thousands of pounds. Two levels have been driven on this lode, and the ground in a great measure taken away, proving the greatness of the deposit of ore. This lode could be worked 40 fathoms below the present workings by pushing forward an old level worked years ago. The Deer Hills lode, on which a shaft has been sunk 17 fms., and was abandoned through an influx of water, produces both phosphate and carbonate of lead, and is embedded in beautiful strata. Other lodes are known to traverse the property."

Meetings of Mining Companies.

SATURN SILVER MINING COMPANY OF UTAH.

The first general meeting of shareholders was held at the London Tavern, Bishopsgate-street, on Monday, Mr. J. H. CRAWFORD in the chair.

Mr. H. N. WILKINSON (the secretary) read the notice convening the meeting.

The CHAIRMAN said that he had first to propose a resolution that two more directors should be elected, and the proposition, having been seconded by Mr. A. E. BLYTH, was carried unanimously.

The CHAIRMAN said that, with regard to the election of those directors, he must inform them that several shareholders had offered themselves for election. The first letter they received was from Mr. Field, nominating Mr. Marshall for a seat at the board. Mr. Marshall was in every way eligible, and was ready to serve if the shareholders elected him. The next letter was from Mr. Ekersley, O.E., of Westminister, also a large shareholder; he offered himself as a candidate, and expressed his willingness to serve. Then there was a letter from Mr. Spratt, offering himself for election, and expressing his willingness to take his seat at the board if elected. To bring the matter fairly forward he would propose that Mr. Spratt be elected to fill one of the vacancies.

Mr. HATHAWAY (the solicitor) proposed that Mr. Ekersley be elected to fill one of the vacancies.—Mr. FIELD proposed the election of Mr. Marshall.

The CHAIRMAN suggested that the fairest method of determining which two of the gentlemen should be elected would be for every shareholder present to write down the names of two of the candidates, and the number of shares in respect of which they (the shareholders) voted, and hand in the papers.

Mr. HATHAWAY remarked that that would be taking a poll; in the first instance the shareholders should demand a show of hands, and if there were not a necessity for a poll it could be demanded.

The result of the show of hands was—for Mr. Spratt, 21; for Mr. Ekersley, 13; and for Mr. Marshall, 4.

Mr. VALENTINE enquired whether there was any objection to have an additional director, and to elect all three of the gentlemen.—The CHAIRMAN was not aware there would be any objection, but there was the difficulty that a fourth candidate had withdrawn his letter of nomination because only two were to be elected, so that if it were determined to elect three it would be necessary to ascertain whether the withdrawal was still intended. The adoption of the proposition would not, therefore, much assist them.

Mr. FIELD felt himself in a rather awkward position, as he did not see Mr. Marshall in the room. He thought Mr. Marshall would be most eager to oppose the directors, and if present he believed he would at once have withdrawn from the contest, but in his absence he thought he could not do otherwise than demand a poll.—Mr. HATHAWAY said that a requisition for a poll must be signed by five shareholders; and if Mr. Field could get four besides himself to sign, the poll could be proceeded with.—Mr. FIELD considered that as only four present he could not get four besides himself, and he could not expect to do that.

The CHAIRMAN then declared Messrs. Spratt and Ekersley duly elected. The next matter, he said, for their consideration was the remuneration of the directors; and he would observe that the directors, seeing the hopeful prospects of the mine, did not wish to take any remuneration until 20 per cent. dividend had been paid to the shareholders. In fixing the remuneration the meeting should take this into consideration.

Mr. FIELD proposed that the remuneration should be 100% per annum.—Mr. HARRISON seconded the proposition.—Mr. VALENTINE suggested that for every 10 per cent. beyond the 20 the directors should have an additional 50%.

Mr. GORE considered that the directors' remuneration was virtually guaranteeing the shareholders 20 per cent., and, therefore, moved as an amendment that the remuneration be 150% per year.

Mr. FIELD begged them to remember that 150% was 2 per cent. on the entire capital of the company; he would suggest that it were better that they should not exercise a liberality which is unusual when all was still merely prospective, and which liberality, he was sure, would not be found wanting when there was reason to exercise it.

The CHAIRMAN then put the amendment, and declared it lost; and was about to put the original motion—that the directors receive 100% remuneration in every year in which 20 per cent. is paid to the shareholders—when Mr. VALENTINE moved a second amendment, that the directors' remuneration be 100% in each year in which 20 per cent. dividend is paid, and a further sum of 50% for each additional 10 per cent.—Mr. CADOGAN seconded the amendment, and upon the Chairman putting it to the meeting nine voted for and nine against it.—The CHAIRMAN said it was obviously a question upon which he could not give a casting vote.

The CHAIRMAN reminded the meeting that this was virtually voting the directors more than 5 per cent. of all profits earned, and objectable as he considered the system of voting directors a percentage on dividends, he would much prefer that course.—Mr. HATHAWAY said that, although an officer of the company, he preferred not to interfere in shareholders' questions, although himself a large shareholder. He must say that he believed it undesirable to leave the question of directors' remuneration to be left open for discussion at meeting after meeting, especially as they would, perhaps, have to deal with gentlemen less liberal than those forming the present meeting, because they might have purchased the shares at a premium, and thus receive a smaller interest upon their investment.

The second amendment was then put to the meeting and carried, with one dissentient.

The CHAIRMAN said that as Mr. Fowler was present he could give them an account of what had been done; but as he claimed to be better able to handle a shovel than make a speech, he had prepared a written report, which he (the Chairman) would read to them; it was as follows:—

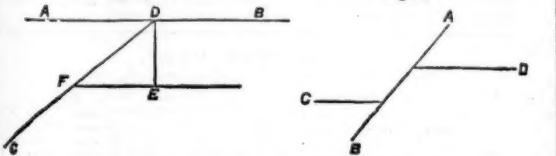
Nov. 20.—Having arrived in London on Friday evening last, and not before knowing of the meeting to be held to-day, I have had little time to prepare for you a statement of the progress that has been made in developing the Saturn mine since you acquired the property, or what my suggestions are as to the future workings.

I shall, however, give a brief statement to you at the earliest opportunity. I can, however, say that the report I sent home as to the value of the property will be fully borne out in every particular, and that you may congratulate yourselves on possessing a most valuable mine, on which the development already made ensures an ample supply of ore for the three furnaces ordered by the board, and for which a contract was entered into by me before leaving Salt Lake City, and operations commenced for their erection. These furnaces, when in blast, are calculated for reducing 50 tons of ore per day, and which I believe will produce 3000 lbs. of bullion per day, which will give a net profit of at least \$90 per ton, or \$300 per day. Mr. Raymond, who is now in charge of the mining, in my absence, estimates the net profit at \$100 per ton, or \$300 per day. The Saturn Mine is opened at various points on the whole course of the claim, everywhere showing indications of great mineral wealth. A shaft, 67 ft. in depth, has been sunk at one point, showing rich ores, streaks of galena, alternating with yellow and grey carbonaceous ores throughout; this vein is 12 ft. in thickness, and in places indicating a far greater width, producing metalliferous matter, containing silver and lead, which united will give a value estimate at \$90 a ton. At another point a tunnel has been run into the hill, but has not yet reached the surface from the surface of the lode of 125 ft. This tunnel has already produced 6 ft. in width, rich in ore, and at its far end about 10 ft. through the main lode; I do not think it has yet reached the hanging wall, and I believe we have yet much more to find on proceeding further. This body of ore, computed, as is usual to do by measurement, will give a total amount calculated to satisfy the most ambitious shareholders. One is more or less influenced by the opinions of others who have had practical experience in these regions, and in this I found I was fully endorsed by the miners of the district, all of whom I can safely say have the highest opinion of this property.

After careful consideration of all matters connected with the success of the undertaking, I came to the conclusion that Sandy Station, on the Utah Southern Railroad, about 18 miles from the mine, and 15 from Salt Lake City, was the proper location for the furnaces, if I could obtain the assistance of the railway authorities in giving the company every facility as to land, siding accommodation, &c., and for this purpose waited on the vice-president and superintendent of the railway, and pointed out to them the advantages which would accrue by the furnaces being erected on their line. They fully coincided with my views, and introduced me to the president, Mr. Brigham Young, with whom I had a long interview, the result of which was that he immediately gave directions that every facility should be afforded me in placing at my disposal whatever land might be required, and accommodate us in every way as to the construction of sidings, and giving us every facility for the satisfactory working of the furnaces. My reasons for adopting this site so far away from the mines were that at any rate the bullion would have to be brought to the railway, and the extra cost of hauling the ores over the cost of hauling the bullion down a very steep hill would be far more than counterbalanced by the cost of hauling limestone, iron ore, and other fluxes up a mountain gorge to the mines, at the same time making us quite independent as to our supply of fuel, also placing us in immediate communication with the rich Cottonwood district, containing the Emma, Flagstaff, and many other valuable mines, thus enabling us to get a full supply of any ores which we might find by experience would pay us well to mix with our ores for the purpose of flux. Beyond these reasons, sufficient in themselves, was the question of the severe winter in the mountain regions, which might cause the furnaces erected near our mines to stand idle for many weeks during winter through being snowed up and frozen over for water, the railway running through the valley, where there is a very mild winter snow and ice collecting only for a few days at a time, and never to such an amount as to create a stoppage of the works. I, therefore, feel confident that the company will endorse my views, and sanction the course I have adopted in this matter very shortly after the furnaces are in full operation, which I have little doubt will be the ensuing New Year's Day. I feel confident that there will be no further draw on the company's re-

Fig. 1.

Fig. 2.



surface the "rise," or "land." Thus, in Fig. 1, A B being the surface, and C D a bed of coal, the angle formed by a straight line, E, is the angle of "dip," or the rise. Geologically this angle is measured by degrees, but in collieries by the number of inches to the yard or fathom. There is a certain inconvenience in this, and the manager of a mine will find that sometimes he will have to use the one and sometimes the other. In the diagram, if the line F to E be a yard, and the line D to E 2 ft. the dip will be 2 ft. in 1 yd. If the angle is determined the next thing is to take the course of the beds or water level. Sometimes, when a valley intervenes, this is a task of difficulty, but if the parallelism of the beds be kept in view the problem is easily solved, and the continuation of the beds will be found on the opposite hill side at the same level. When there is a depression in the course underground it is important to obtain the true level, in order to drive the galleries horizontally. The term "level" does not imply that a true level is obtained. If that were so the water would flow in the roadways; and, therefore, a slight descent is given towards the pumping-shaft, but still the line is very nearly level. The course of the bed should be made out on a geological map, and be taken with reference to the meridian. If the strata are horizontal, or nearly so, they are said to be "flat;" if they dip at a great angle they are said to have a "strong dip," or a "violent dip," or occasionally it is called "a rearing measure," or one "standing on its end," terms which obviously indicate a great deviation from horizontality. Again, as to thickness of beds, great care is requisite to prevent serious mistakes. It frequently happens that when a bed is reached, and the shaft sunk through it, the thickness is estimated by the distance made by the shaft in it. If the bed was horizontal this would be correct, but just as much or as little as it deviates from horizontality it is erroneous and misleading. The true thickness of the bed is described by a line drawn from wall to wall, or between the roof and floor of the deposit, a measurement which may be almost at right angles to that along the direction of the shaft. The "roof" is the upper boundary or side, and the lower is called the "floor," the "pavement," or the "sole." What is called a good working thickness, or even a convenient thickness, differs according to the nature of the material. Thus, while beds of coal from 3 ft. to 1 ft. in thickness are regularly got, there are some of much less size placed under favourable conditions, which are worked. In Somersetshire certain seams of only 1 ft. 2 in. in thickness are worked to advantage, but, as a rule, nothing is considered workable under 3 feet. When, however, a number of these seams come close together, and the intermediate bands are easily disintegrated and separated, the whole mass is frequently worked at once. In other districts 10-feet seams are not uncommon; but the finest bed in England, and, perhaps, in the

sources, and that the mine will at once be not only able to pay its way, but return a profit of 50 to 75 per cent, upon the capital of the company, and I fully trust even more than this. I am fearful of indulging too much in my estimates, as it may be supposed that I am exaggerating the value of the property, but when we see the marvelous results already achieved in this district of country, and the wonderful wealth that has been in the short space of two years exposed throughout the territory of Utah, I am sure from the extensive examination I have made from numbers of mines, I am not too sanguine in the results I expect from this development of the property of the Saturn Silver Mining Company.—FRAS. FOWLER, M.I.C.E.

Mr. FOWLER, in reply to various questions, stated that when he was at the mine, three weeks since, four men were breaking 20 tons of ore per day, and quite up to the roots of the grass. The ore was really very deceptive; you would sometimes suppose it was more dirt, but it was really a very good ore. He took down some to the assayer, and had only obtained the results since he had arrived home, as he was leaving the following day: the results were excellent. A grey and yellow carbonate assayed 38 per cent, for lead, and 50 ozs. of silver to the ton of 2000 lbs., so that it was worth \$72 per ton. A galena assayed 55 per cent, for lead, and 47½ ozs. of silver per ton of 2000 lbs., and was, therefore, worth \$103. Another galena assayed 55, and another carbonate \$76, so that they might assume that the galena generally were worth about \$100 per ton, and the carbonates from \$70 to \$80. There was plenty of labour, and plenty of flux, fuel, &c., cheap.

The CHAIRMAN thought that Mr. Fowler was entitled to their thanks for taking the bold step of determining upon the site near the railway instead of at the mines for the erection of the furnaces.

A SHAREHOLDER enquired how far the furnaces would be from the mine, and what were the advantages anticipated?—Mr. FOWLER explained that with the furnaces at the mines there would have been many difficulties during the winter season when the mountain was snowed up and the water all frozen, but at the railway which runs through the valley, and was but 18 miles distant, they seldom had more than two or three days frost together. As to haulage, there would be no additional expense, for it would cost less to run the ore for 18 miles down a steep hill all the way than to haul the fluxes, fuel, &c., up to the mines, and carry down the bullion. Several of the managers of other furnaces there said they believed he was doing the right thing, and that in less than two years they would have to pull down their own furnaces, and build new ones in the valley.

Mr. SPRATT moved, Dr. RYAN seconded, and it was resolved, that 300l. be voted to the directors for their past services.

The CHAIRMAN, in acknowledging the vote, observed that it was well that the meeting should know that they had received the best legal opinion as to their title, and that everything was in perfect order.

Mr. SPRATT enquired whether they had taken any steps for their quotation on the Stock Exchange?—The CHAIRMAN said that Mr. Wilkinson was doing all that was necessary, and he had no doubt all would be quickly arranged.

Mr. VALENTINE believed some alterations were required in the Articles of Association.—Mr. HATHAWAY explained that a distinct clause was required prohibiting the directors from using the company's money for dealing in shares of the company, and the clause providing that all dividends not claimed for three years should be forfeited must be removed.

Mr. GOLF moved, and it was agreed, that at the earliest opportunity the shareholders should be called together to pass the necessary resolutions for making the alterations.

The proceedings terminated with the usual complimentary vote to the Chairman.

ST. IVES CONSOLS.—At the meeting, on Tuesday, the accounts for the three months ending September showed a debit balance of 1111.16s. 7d. The profit on the three months' working was 261.17s. 8d. Capt. Martin and George reported that in consequence of the great quantities of fish caught at St. Ives in the last two months they have been during that time deprived of a large number of their men, boys, and girls, which has materially lessened the amount of tin they would have returned. The prospects of the mine are not materially altered in the past quarter. There are 150 hands underground; of these 61 are on tribute, at an average of 8s. in 17.

DOLWEN AND EAST DOLWEN COMPANIES.—At an extraordinary general meeting to be held, according to advertisement in another column, on Friday next, a series of resolutions will be brought forward for amalgamating the two undertakings as the "Dolwen Consolidated Company," with a capital of 12,000l., in shares of 1l. each. In a circular issued in connection with the proposed amalgamation it is mentioned that the recent and important intersection of the Dolwen lode in East Dolwen grant makes, in the opinion of the directors, the present time most opportune for an amalgamation of the two concerns. This arrangement will tend to avoid complications in the workings, conflict as to the water supply in common, and, as the Dolwen Company has a shaft sunk to a considerable depth close to the boundary of the two mines, the workings therefrom can after the amalgamation be extended east and west without let or hindrance. Of the 12,000 Dolwen Consols shares, 10,000 will be absorbed to exchange share for share with those of the existing companies, and the 2000l. additional capital will at once be issued, *pro rata*, at par.

[For remainder of Meetings see to-day's Journal.]

MINING NOTES FROM NORTH WALES.

Despite the fact that a number of miners are now standing idle yet, on the whole, there is more activity in the lead mining districts of North Wales than for several years past; whilst the out-pit of ore is increasing, and several new companies are in course of construction. In some Notes published towards the close of last year it was stated that the comparative quietness which then prevailed in several districts resulted in many instances from the want of sufficient capital for the purchase of machinery powerful enough to overcome accumulations of water, and also for minimising manual labour. Many of these difficulties have now passed away, so that there has been a marked change for the better, capitalists having been induced to invest more freely in mining property, and with every prospect of being well repaid for their ventures. Looking at the business done during the last ten months, the production of lead ore throughout North Wales for 1871 will exceed 30,000 tons. The Van, as a matter of course, maintains the lead, so far as production is concerned, whilst the returns from Minera, Talgoch, and others are large.

In the Mold district several of the mines are doing well, whilst others are in what may be termed a transition state. Not a few that have been closed for several years are now about to be reopened, and it is believed will be profitably worked. Amongst the latter may be mentioned the Belgrave Mine, closed about 15 years ago, previously to which it was a very profitable concern, and paid nearly a million sterling in dividends. The Marquis of Westminster is the lessor of the mine, and the company that have taken the mine propose to sink a new shaft to the east below the existing workings, and by so doing open out an entirely new field.

The Pant-y-Mwyn Mine, formerly known as the Mold Mines, a valuable concern some 25 years since, is also about to be resuscitated under the auspices of a limited company, under the name of the Pant-y-Mwyn Consols, with a capital of 100,000l. When in full operation, at the time stated, upwards of 400 tons of ore were raised monthly, the price at that time being only 7l. per ton. All that appears necessary to make the mine a truly excellent and profitable one is the necessary powerful machinery for clearing and working it.

Cod Cymrie, in the Mold district, near to Maes-y-Safn, is another mine which is about to be opened out after standing something like 12 years. It is to be worked by a limited company, principally of gentlemen resident in London, with a capital of 25,000l. When in full operation a large tonnage of ore was raised, but it is said by practical men that owing to some mismanagement the lode was lost, but was found recently to the north of the old workings. It is confidently believed that if a cross-cut was made north from the old workings, so as to intersect the main lode, the results would be in the highest degree satisfactory, and all that could be desired by those interested. The prospects of the new company appear most promising, and it is to be hoped the profitable working will give increased confidence to those seeking safe investments in mining properties.

The Mold Mines, formerly the Old Cathole, which were taken to by a new company about a couple of years ago, are not doing so much as could be wished, owing to the preference to the working operations by the water and sand. They are now raising from 25 to 30 tons per month, but when the troublesome visitors alluded to have been overpowered a much larger tonnage will be obtained. A short distance from the last-named mine is the Glyn Alyn, of which we have on more than one occasion reported most favourably. A good deal of the necessary work was done by a large water-wheel, and a considerable quantity of very good lead brought out. Operations have now been suspended owing to a want of capital. Working, however, is to be shortly resumed by a fresh company, with a capital of 25,000l. Seeing that the mine has been well proved, the lead being not only easily accessible but in abundance, the success of the new company admits of no doubt.

The Rhosmor Mine is still quiet, owing, it is said, to the accumulation of water, leaving in the bottom, were informed by an eminent engineer, one of the finest bunches of ore probably to be found in Flintshire—there having been, in fact, two or three new lodes intersected, thus ensuring large quantities of lead when work can be fully resumed. The men are now driving above the water to the new lodes, from which great things are anticipated. The ore formerly raised at Rhosmor was about the richest in Flintshire, giving 12 ozs. of silver to 1 ton of lead. Near to Rhosmor is the Hendra Mine, closed for some time, but now about to recommence working. There is a great deal of water in the locality, and which has been most disastrous to the prospects of several mines, and if that company and the Rhosmor were to act in conjunction with each other both would be advantaged, and probably secure for the shareholders what they have long been looking for—a dividend. North Hendra continues productive, and discoveries of ore appear to be increasing to the north-west of Rhosmor.

Talgoch continues to do well—as it has long done—the ore being of a very rich character; and the same remarks apply to Trelogun. There is little or no change with regard to the mines in the Holywell district.

The Maes-y-Safn Mine, which was stopped recently, and nearly the whole of the machinery disposed of, was some time since one of the best paying properties in the district. The company that owned it previous to the last one received something like 500,000l. in dividends. It is a mine requiring very powerful machinery for working, being from 400 to 600 yards in depth. There is every probability that it will not be long closed, seeing that where investments can be safely made there is no lack of capital, and that North Wales is becoming a favourite place for mining speculation.

In connection with four of the men recently engaged at the above mine, a most unexpected piece of good fortune has fallen, and one of very rare occurrence to those whose only capital are their hands. After being discharged from Maes-y-Safn on its being abandoned they took a place adjoining the old Belgrave Mine, in Denbighshire, from the agent of the Marquis of Westminster. Without the aid of machinery they in a very short time made a most valuable discovery of rich ore. They found a lode to the depth of 4 ft. with less than 100 ft. of solid. The mine, it appears, can be worked to a considerable depth without machinery, and the fortunate finders now ask 4000l. for their interest in the concern.

Great success is expected to be realised from the Fron Fownog Mine, near

Mold, which we understand has been taken to by a company, principally of Liverpool gentlemen, and is intended to be worked with spirit. A square shaft is being sunk, and an 85-in. cylinder Cornish engine is being put down by the Perran Company for pumping the water out, and under the superintendence of the company's engineer, Mr. W. C. Pagin, of Liverpool. The mine when finished will be one of the finest in the county, and is likely to be very valuable, seeing that the lode is known to be rich in minerals.

The East Maes-y-Safn Lead Mining Company (Limited) has been obliged to stop altogether, and leave it to the shareholders to say what is to be done. It appears that the water got into the work, rendering it necessary that a large engine should be put down. From a statement just issued to the shareholders it appears that Messrs. Gray and Howell attempted to raise the necessary capital required for carrying on the mine, but were unable to do so, partly in consequence of Mr. Underwood, the late contractor for the large engine, having made certain claims which the directors cannot for a moment admit, and threatened certain proceedings, which the directors are advised could not possibly succeed, but which, if commenced, might involve the company in litigation and expense. Mr. Underwood having persisted in his demands, Messrs. Gray and Howell declined to proceed with their efforts to find additional capital. It further appearing that Mr. Underwood had instructed his solicitor to take proceedings to enforce his claim, both as a shareholder and contractor, the directors deemed it their duty to call a meeting of the shareholders to consider the advisability of winding up the company, so as to put an end to the present complications. Accordingly they called a meeting of the shareholders at the company's office, in Chester, for December 6, to consider and approve of the following resolutions:—"1. That it is expedient the company be forthwith wound-up voluntarily, under, and in pursuance of, the provisions in that behalf contained in the Companies Act, 1862."—"2. If liquidation be determined on, to consider and pass such special resolutions as to the meeting may seem fit, as to the mode of carrying out the liquidation, or as to any re-construction of the company." Considerable opposition, it is understood, will be given to the proposal for winding-up.

FOREIGN MINING AND METALLURGY.

The animation which has been remarked of late in the iron trade of the St. Dizier group continues, and is sustained so firmly that there seems to have been a serious revival in affairs. This improvement is not confined to the St. Dizier group, but the advices received from the South, the Centre, and the North of France are unanimous in declaring that an abundant demand prevails for the principal articles. The situation would, indeed, be generally good but for the transport question, which is everywhere a source of grumbling and complaints. That these complaints are not ill founded is shown by the fact that in the Maubeuge district several large and important metallurgical establishments have suspended operations in consequence of the want of combustible which they experience. A large body of workmen are thus deprived of wages at a period of the year which necessitates a heavier expenditure on the part of the working classes. At St. Dizier pig has been for some time past the object of a sustained demand. Refining pig has been dealt in at about 5l. per ton; for half coke-made pig some important contracts have been concluded, at 4l. 2s. per ton, while some makers ask 4l. 4s. per ton. Coke-made pig has brought 3l. 12s. per ton. In pig for re-casting some transactions have been concluded at 4l. 8s. to 4l. 10s. per ton, according to the importance of the orders given.

In the Liège group both the coal and the iron trades are overdone with orders, but the inadequacy of means of transport which still exists causes very grave inconvenience. The collieries have had to slacken their production from the want of trucks, and the ironworks, obliged to extinguish their furnaces, or to reduce their make, are condemned to experience losses during a period which, under more favourable conditions, would give them brilliant profits. In the Charleroi district the important question of transport continues to occupy the foremasters, whose supplies of coal, coke, &c., are so compromised that several leading companies talk of having recourse to the old method of conveyance by horses. Orders continue abundant, and embrace every description of iron and pig. Refining is quoted at 3l. 6s., and casting of good quality at 3l. 16s. per ton. It should be remarked, however, that at these rates the owners of blast-furnaces would not consent to enter upon important and long-terminated contracts. The Charleroi coal trade remains in much the same state; there is an abundance of orders, however, for all descriptions of coal, and an absolute want of means of transport by railway. This state of things can scarcely be prolonged much further, but meanwhile the working classes will suffer a good deal, as the extraction of coal, which was everywhere large and regular, will soon be reduced, the pit's mouth being encumbered with coal which has been sold, but which cannot be delivered. The deliveries by water to France, Brussels, and Flanders have moved on very well of late, a large number of boats being at work. Prices of coal are very firmly supported, and some colliery companies have even advanced their rates for some descriptions.

It is satisfactory to find that the administration of the Belgian State lines has thoroughly awakened to the necessity of providing an efficient supply of rolling-stock upon the system. The Minister of Public Works has applied to the Chambers for a credit of 431,200l., almost the whole of which is to be devoted to additional rolling-stock. Thus 1000 coal trucks are to be provided at an estimated cost of 103,000l., and 400 coke wagons at an estimated cost of 49,600l. No fewer than 58 new locomotives and tenders are also to be provided, as well as 30 tenders for locomotives furnished previously without tenders. The locomotives and tenders are estimated to cost 174,000l. The Minister contends that his department has not been neglectful in supplying rolling-stock in former years, but that the coal traffic has increased so rapidly of late that it has been difficult to keep pace with it. He also states that so anxious was he to meet the requirements of industrialists that he ordered 600 coal trucks upon his own responsibility, without having first of all obtained the authority of the Legislature.

FOREIGN MINES.

EBERHARDT AND AURORE.—The directors have received a further remittance of 12 bars of silver, valued at 2750l., and the following telegram:—October produce, 11,000l.; total expenses, 6000l.; profit, 5000l.

PACIFIC.—H. Pridoux, Oct. 30: The mine during the past week yielded 23 tons of ore; assorted from the dump, 4 tons—total, 26 tons. The overhauling of the dump is completed; hereafter this will not appear in my reports. The stopes continue to look much the same as when I last reported, and are producing very rich ore. Nos. 6 and 7 stopes are leased to a party of men, the company holding 50 per cent. royalty. I have had a further drive west of stopes 70 ft.; the ledge for this distance will average 1 ft. wide, and the ore from here is of a fair quality. The ledge in the north cross-cut is much the same, there being no alteration to remark.

SWEETLAND CREEK.—J. McLean, Oct. 26: I will press the tunnel to completion as fast as possible. My new hydraulic apparatus will be put in place at the end of this run, and then all attention will be given to forwarding the tunnel. In the meantime, I have put two additional men on, working ten-hour shifts, and interlapping with regular shifts, and think this week we shall drive 30 ft., which progress is almost unparalleled in this vicinity. The rock continues very good for progress, the seam still good, and everything favourable.

BATTLE MOUNTAIN.—Capt. Richards, Nov. 2: Virgin: In the 113 feet level north the lode is of a very promising character, showing spots of ore, and having generally a good-looking appearance. In the 73 ft. level north the lode is showing certainly good stones of ore, and giving indications of another good shoot of ore ahead. The stopes in the back of the 113 ft. level north contain a large lode of black oxide, copper glance, and iron pyrites—a good lode, but of medium quality only. The stopes in the back of the 113 ft. level, south of Roach's winze, has produced a fair quantity of red oxide and native copper, some green carbonate and black oxide, but is not now looking quite so well. I hope, however, the change is only of a temporary character. Pascoe's stopes, in the back of the 37, turn out some rich ore. The stopes in the back of the 73, north of Jury's rise, which in future will be called Jury's stopes, are tuning out some good ore. Ore raised during the week, 516 sacks.

[For remainder of Foreign Mines see to day's Journal.]

MINING IN CALIFORNIA.—The annual report of the Eureka Gold Mining Company, of Grass Valley, Nevada county, for the fiscal year ending Sept. 30 has just been issued. The mine has long been favourably known as a very productive gold quartz lode, though recently the grade of ore has been very low. The report of Superintendent Watt for the year ending Sept. 30 shows 17,447 tons of quartz extracted. The amount of ore crushed was 18,560 tons in 305 running days, with a 30-stamp mill. Only 15 stamps are now being used, on account of a scarcity of water. There were 950 feet of drifting and cross-cutting made. The main shaft is sunk 849 feet on the ledge, or 786 feet vertically, of which 120 feet was sunk and timbered during the past year, besides re-timbering 110 feet and sinking 200 feet of winzes. From the financial statement of the secretary we condense the following:—Receipts, including cash on hand, bullion, sulphurets, &c., \$651,708. Disbursements, including mining and milling accounts, &c., \$625,840, of which \$360,000 were paid out as dividends to stockholders. The company have no liabilities, and the assets aggregate with cash on hand \$127,477. The average yield of the ore for the year was \$30 per ton, and of the sulphurets \$158.23. There were 275 tons of sulphurets worked during the year. The average cost of mining the ore was \$8.82, and the average cost of milling \$3.02, or a total of \$11.84, leaving a profit of \$19.16 per ton. The average cost of concentrating sulphurets was \$18.88, and of reducing the same, \$22.19, or a total of \$41.07, leaving a profit of \$18.13 per ton. The total profit of the operations of the mine for the year was \$339,763, or nearly \$30.00 a ton less than was paid in dividends, showing a draft to that extent on the surplus carried over from the previous year. The mine went into operation on October 1, 1863, since when the receipts have been \$3,382,743, of which \$3,363,234 was from bullion taken out.

The disbursement for the same period were \$3,342,495, of which \$1,594,000 in dividends to stockholders, \$133,156 for construction, \$1,29,492 for mining, in filling, and other current expenses, and \$296,898 for mines. No dividends have been paid since July, and there is no prospect of a resumption of dividends. On the 1st inst. there were 25 tons of quartz on the surface, and 550 tons broken in the mine, ready for hoisting, the value of which, as put down in the assets, is \$9129. The company hope to crush a sufficient quantity of ore to meet current expenses until new bodies can be discovered and opened.

THE CAPE DIAMOND FIELDS.—The last packet brought on freight 22 packages of diamonds, valued at 90,000l., and the yield at the diamond fields continue on the increase, and it was calculated by competent judges that the value of the finds cannot now be less than 40,000l. a week, or nearly 6000l. a day. The Standard and Mail says:—"Of this amount one-half, it is thought, is chased at the fields by diamond merchants, and the other half is shipped by finders. With respect to the successful and unsuccessful diggers, the percentage at the various diggings, except at De Beer's (New Rush), is believed to be 25 per cent. of 100, and at De Beer's 75, at which latter place, although the find is only a little over two months old, there are 10,000 diggers at work. The claim here extend to an indefinite depth. Diamonds have been found 50 ft. below the surface. As much as 300 carats have been taken out of one claim; a claim containing an area of 80 ft., and a company generally does not work more than 1 c. come. Claims here have been sold for 1000l. each, and in one instance a claim was sold for 500l. cash, and a farm in the Transvaal Republic of 150 morgen." As an illustration of the rapid development of the diamond trade and Co. sold diamonds in Capetown to the value of upwards of 4000l., and was the third diamond sale held during the week. The inland transport of diamonds were about to dispatch two wagons a week to the fields, one not being sufficient. The distance is done in about a week.

DUNLOP'S PATENT INDEX.—Those who have the control of large and varying lists of names, such as the roll of their workmen, smelters, miners, &c., with such points in connection with their work, time, &c., as they wish well to record, will hail with satisfaction a new system of indexing, which is well adapted to that end. It consists of a frame, on the side bar of which are placed one behind the other the entries already alluded to. The labels are displaced by a centre rod (which can be withdrawn at pleasure), and are carried through them all at the upper end of a vertical slot in each label. This slot enables the labels to be lifted one above the other for reference, but being closed prevents their removal, and fixes their position. The labels have a horizontal joint, which enables the reader or searcher, when he has lifted the label to throw back the upper half flat on the top of the succeeding labels, and on it, or copy the entry, or add thereto. The advantages of this system of book will immediately appear to one who knows what difficulty there is in finding entries of any kind in strict dictionary order. If one label gets full, and can be placed behind it, and the interpolation is easily effected by withdrawing the centre rod so far as is necessary to allow of the new label being dropped into its proper position. This interpolation, which is impossible in books, becomes therefore, easy under this system. Indexes also, along the frame, slightly higher than the labels, make the task of reference much easier than in a book. In fact, an index open at all its pages at once. The frame, which can be either standing on a table or sliding under it, in the shape of a tray, are made to hold labels of two sizes—one small, for lists of miners, customers, &c., and the other larger, suitable for library catalogues and large public lists. It seems that this patent has a good and useful future before it; it is a means expensive, and is, therefore, likely to be largely used. It has been adopted by the Royal Dublin Society's School of Art, by the Landed Estates Court, Record of Title Office, Registry of Judgments Office, Ireland, and provisionally ordered for the Royal Dublin Society's Library. It has also been taken up by the Commissioners of the Patent Office for their library; and Mr. J. W. Jones of the British Museum, has passed a favourable judgment on it. The invention has been bold enough to show, in the face of the existing systems, that the systems are faulty, and has produced a contrivance which bids fair to displace them. We trust that his efforts may be rewarded with success in the future.

SPRING BALANCE SAFETY-VALVE.—According to the invention of Messrs. FIELD and OLIVER, of Adelphi, differential lever of the third order, interposed between the spring and the valve, to operate in such manner as to reduce the leverage when the differential levers are being raised by the valve, and thereby to counterbalance or neutralise the additional downward strain which would otherwise be put on the valve by the action of the spiral spring. The invention further consists in making such safety-valves with annular rings or ways, so as to afford more ready means of escape for surplus steam, and moderate life of the valve, and in the application of a small hand lever, such as is used in the valve, to enable the valve to be raised by hand from its seat, so as to ascertain whether the valve is free and does not stick, but so, nevertheless, to prevent the hand lever from being used for holding the valve down upon its seat.

CHEMICALS AND MINERALS.—Messrs. J. Berger Spence and (Manchester, Nov. 23).—The trade in chemicals for this season of the year a very satisfactory condition. For home consumption orders are given of plenty, but the foreign demand has sensibly declined; the market, therefore, necessarily quieter for present delivery. Manufacturers, hopeful, do not, rule, lower quotations. Liverpool exports of chemicals have diminished, and are less than usual. Caustic soda and soda ash are in pretty good request, and value. Soda crystals are in fair demand. The usual requirements for export have rapidly run up the price of sulphate of copper, and makers are disinclined to book any orders under 27l. The revival of nitrate of soda about 10 symptoms of a relapse to 16s. Prussiates are still scarce, with a tendency to rise. Benzole rather animated. Bichrome held at 10d. Alum great and uniform demand. Bleaching powder, dull at 13l.; sales made for 1872, at 11s. 3d. Sulphate of ammonia still keeps high, although shipment to the Continent have almost ceased. Muriate of potash looking upwards.

The mineral market maintains its ceaseless activity. To say that the market is in the power of her coal and ironstone is by no means an exaggeration; they tend, with the skill of her artisans, to keep and improve the manufacturing all kinds here. Coal, as a cheap and convenient source of heat and power, found nothing as yet which can with it successfully compete. These resources are dominant, and we desire to make the world not only cognisant, but acknowledge the fact. The navigation of England is kept alive by the trade, and it gives her the first command of the seas. Without coal her ironstone would be valueless—having no wood to spare—with coal, her iron becomes of infinitely more value than gold; and we have to reiterate the fact that the demand for ironstone is largely in excess of supply. In short, pig-iron makers appear inclined to give almost any price for a trial, a fact, which, perhaps, was never before recorded. The Scotch iron trade is about to be slightly extended by working what is called Iron Mountain of Gellistrath. Hematite ores are in constant demand; large piles, known as Somerostrath, are said to be forthcoming from the North of Scotland for Bessemer purposes. Oolitic ores for four ry use claim marked attention. Another source is about to be opened up in Leicestershire. In Northamptonshire the demand for ironstone is so great that orders are a good way behind their execution. The production of ironstone in the North of England, South Staffordshire have advanced limestone 6d. and lime is a ton, per exceedingly brisk. Mineral phosphates readily saleable. No imports of alum the last week.

The prosperity of our metal trades appear weekly to become more and more intensified. Abundant iron, under our industrial genius, has forged new the links of our expansive commerce. By means of iron we have mainly to our greatness; and the loss of the prestige of iron will lower us in the eyes of nations. Such an epoch is, however, probably very far off. We have the stood alone in our production of iron, and in the values of iron; the vances, nevertheless, have been gradually made, and we have this week chronicle a further advance in pig-iron, both in Scotch and Middlesex. Shipments are already 180,000 tons in excess of last year.

COPPER ORES.

Sampled November 1, and sold at Swansea, November 21.							
Mines.	Tons.	Produce.	Price.	Mines.	Tons.	Produce.	Price.
Knockmahon 123	9	...	25 19 6	West Canada 64	...	19 1/2	...
ditto 82	43	...	2 5 6	ditto 63	...	19 1/2	...
ditto 119	107	...	7 6 6	ditto 37	...	19 1/2	...
ditto 70	107	...	7 2 0	Brass Ashes 57	...	19 1/2	...
ditto 72	107	...	7 2 0	ditto 117	...	19 1/2	...
ditto 46	167	...	11 12 0	ditto 69	...	19 1/2	...
ditto 121	167	...	11 12 0	Sobral Ore 61	...	19 1/2	...
Cape Reg. 45	407	...	3 6 6	ditto 51	...	19 1/2	...
ditto 41	477	...	34 2 6	ditto 16	...	23 1/2	...
ditto 9	31 9 6	Copper Ore 34	...	14 1/2	...
ditto 62	467	...	33 15 6	ditto 11	...	15 1/2	...
ditto 32	513	...	37 10 6	ditto 8	...	14 1/2	...
ditto 26	48	...	24 14 6	ditto 2	...	20 1/2	...
ditto 14	467	...	33 8 6	Berehaven 46	...	8 1/2	...
ditto 35	358	...	48 35 6	ditto 28	...	8 1/2	...
ditto 11	627	...	48 0 0	ditto 24	...	19 1/2	...
Cape Ore 64	197	...	13 17 0	ditto 16	...	8 1/2	...
ditto 63	167	...	13 16 0	Cop. Regular 39	...	28	...
ditto 63	167	...	13 16 0	ditto 10	...	21 1/2	...
ditto 25	287	...	16 11 0	Copper Ore 12	...	18 1/2	...

TOTAL PRODUCE.							
Mines.	Tons.	Produce.	Price.	Mines.	Tons.	Produce.	Price.
Knockmahon	633	...	£117 18 6	Sobral Ore	128	...	£8 1/2
Cape Regular	275	...	9673 9 6	Copper Ore	55
Cape Ore	15	...	315 0 0	Berehaven	46	...	8 1/2
Mounta	278	...	3511 9 0	Copper Ore	49	...	8 1/2
West Canada	164	...	2322 11 0	Copper Regular	12	...	18 1/2
Brass Ashes	253	...	406 1 0	Copper Ore	12	...	18 1/2

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
P. Grenfell and Sons	3664	£2467 5
Stans, Williams, and Co.	984	1817 17
Vivian and Sons	210	538 17
Williams, Foster, and Co.	277	4063 12
Mason and Elkington	25	1115 14
Charles Lambert	2	4433 16
Swetland, Tuttle, and Co.	2	4433 16

NO SALE ON December 12.

TOTALS AND AVERAGES.

Whole sale.	2046	167	£11 15 1	158.11d.	£ 91 12
-------------	------	-----	----------	----------	---------

EXTRACTING METALS FROM THEIR ORES.

Some important improvements in the means of utilising the products obtained during the extraction of silver, lead, copper, and other metals from their ores have been invented by Capt. J. W. DOBLE, of Blackstock, the chief object of his invention being to utilise by-products formed in the process of calcination with sodic chloride. He takes the silver ore to be pulverised very fine, which, by the aid of a stream of water, is passed through very fine grates. He conveys the into tanks about 18 ft. long, 2 ft. wide, and 20 in. deep; several these tanks are placed side by side, so that when one is filled the ore is conveyed into an empty one. He regulates the water so as to effect the separation of the ores according to their density. He classifies the ores into three portions. The first portion he takes from the bottom of the tank for the length of 6 inches, and this he finds contains the largest amount of ore. The second portion he takes from the next 6 inches in length of the tank. The third portion about 2 feet more; if found rich enough to pay for the extraction of the ore, he also treats. If not sufficiently rich to pay for extraction he takes from the tanks, he concentrates it by means of "Collom's Concentrating Ore Dresser." The remaining portion of the ore contained in the tanks he works over by the apparatus above named. The quantity of water to be mixed with each portion he regulates according to the nature of the ore. After the calcination of the ores he treats them in the usual amalgamation process. After the extraction of the silver, the refuse he washes out of the revolving barrels into large tanks; he then conveys the same to chambers made air-tight; connected to these chambers he erects a kiln for calcining calcic carbonate. The gas which is evolved, and known as carbonic anhydride, is conveyed into the chambers containing the refuse from the amalgamation; he then treats this refuse with the evolved carbonic anhydride, which combines with the sodic salts contained in the refuse, forming sodic carbonate. He then conveys the carbonised stuff to a large floor, around which are small canals. The heaps of stuff he moistens with water, which conveys the sodic solution by means of these canals to evaporating tanks. After evaporation the sodic carbonate will be found in large quantities. He filters the water in the revolving barrels, and conveys the same to evaporating tanks; adds hydric sulphate to the solution, which contains a large amount of sodic salts, and produces crystallised sodic sulphate. The calcic oxide formed in the calcination of the calcic carbonate is placed in heaps, and throws water over the same; the calcic hydrate formed is sifted fine, and conveyed to chambers. The chlorine which is evolved during the calcination of the ore, is conveyed to lime chambers, and combining with the calcic salt from the ground known as calcic chloro-hypochlorite, or commonly known as bleaching powder. When silver and lead are found in combination (as galena) he chloridises the ore, as in the process for silver ores, with a sufficient quantity of sodic chloride as will chloridise both. After calcination, he conveys to tanks large enough to contain two or three tons of the calcined ores. He passes a stream of boiling water through the ore until all the chloride of lead is dissolved, places a filter in the bottom of the tanks, and the water containing the plumbic chloride in solution he conveys to evaporating tanks, and concentrates the liquid. After allowing it to cool to about 100 degrees, he causes a strong solution of sodic carbonate to pass through the liquid containing the plumbic chloride, when he causes a cooling to take place, when plumbic carbonate (or white lead) is precipitated, and sodic chloride held in solution within the liquid, which, being filtered from the lead, he causes to be evaporated, and again utilised in the calcination of the ores. The silver to be obtained by the amalgamation process. When silver is in combination with arsenic and copper he calcines the ore to volatilise the arsenic, then re-calcines the ore with a small amount of sodic chloride, removes it from the calcining furnace, and in tanks sufficiently large to hold 2 or 3 tons of the chloridised ore, and then places by the side of these tanks a suitable retort, containing calcic chloro-hypochlorite, then adds hydric sulphate in small quantities to evolve the chlorine gas held in combination with the lime. He next conveys the gas to perfectly air-tight tanks, containing the ore, previously damped, and allows it to remain 14 hours, then passes a stream of boiling water through the ore, filters, passes into evaporating tanks to concentrate, the liquid holding hydric salts in solution. He then conveys a strong solution of the carbonate into the concentrated liquor, thereby precipitating the carbonate, and can by passing a concentrated solution of sodic sulphate obtained after the ores have undergone amalgamation form the sulphate, or blue vitriol. When silver is found with sulphur he evolves the sulphur, which utilises in the making of hydric sulphate, for which purpose he produces a new material for the formation of acid, being a very valuable silicate, on which no acid can cause the least effect, by which an erect chambers at a much less cost than with either lead or iron. The treatment of ores containing silver and antimony, silver tin; will be analogous to the treatment of the other ores.

FERRIES BLAST FURNACE.—The first part of the invention of JAMES HUNTER, of the Coltness Ironworks, consists in rendering such furnaces more efficient by raising the materials in the part of the furnace to a higher temperature than obtained in the ordinary arrangements of blast-furnaces, thereby enabling a greater amount of materials to be smelted. The second part of the invention consists in combining with blast-furnaces having a range of flues at the top for passing the gases through to raise the temperature of materials at that part of the furnace, such, for example, as the iron known as "Ferry's Blast-Furnace," or with furnaces armed with blast or air apparatus for producing more intense combustion at the said upper part of the furnace, mains, pipes, or passages communicating with calcining kilns, through which a portion of the whole of the waste gases are conducted, and caused to calcine iron ores or ironstones, or other ores or limestones.

IMPROVEMENTS IN TREATING PYRITES.—The invention of Mr. JAMES, of Westhofen, Prussia, consists in taking raw pyrites, common oxide of iron, in the form, by preference, of burnt iron pyrites, all in powder, forming them into bricks, with the aid of a little water; and drying them heating or igniting these bricks in a reverberatory or other furnace, care being taken to arrange the bricks in the furnace so that steam may have free access between and amongst them.

SIGNAL INDICATORS FOR MINES.—Messrs. BRYDON and KENDALL, Glasgow, have patented an improvement in signal indicators or mechanisms and other purposes. The indicator consists of a drum with seven or eight of sides, upon which figures or letters are made that show through the case of the drum, which can be turned backwards and forwards to any required side before the hole; there are also pins or spindles in the drum which come against a spring lever hammer, each pin or spindle in passing one stroke on a bell. For mines, three of these indicators are used, the bottom of the shaft, one at the top, and one at the engine-house, and connected by wire-rope to move together, and are brought back to show "stop" by a weight, when the handle or handles employed to actuate them are released, each of these handles acting upon or against a notched sector, which correspond to each signal upon the drum.

WEIGHING AND WEIGHING COAL.—Mr. JOHN HOPKINSON, of Northampton, has specified improved machinery or apparatus for weighing, delivering, or storing, and weighing coal, and other minerals and other substances. This improved machinery consists of an arrangement of a hopper, or boxes, attached to an endless-chain, working over a tumbler, and by steam or other power, delivering the coal into a shoot or a hopper, and it is preferred to use a large box, or hopper, with sloping sides, which a shoot, or spout, may be used to convey the coal into the ship's hold. A weighing-machine may be fixed in the shoot.

STEAM-ENGINE GOVERNOR.—Mr. S. B. ALLEN, of Massachusetts, has patented an improved steam-engine governor. The nature of the said invention consists in an improved steam-engine governor, as composed of a paddle, or rotary series of paddles, two separate shafts, and a rotary closed case, arranged so as to operate substantially in manner as explained in the specification, and represented in the drawings accompanying the same. The governor is represented further consists in the combination of a scroll or spiral, as described, and the valve case, valve, or valves thereof, and the operation of the latter, all being substantially as described and represented in the specification and drawings accompanying the same. The nature of the invention further consists in an arm and shaft as arranged and connected with the balance valve stem of the said case and its inlet, all being as described in the specification and shown in the drawings thereon.

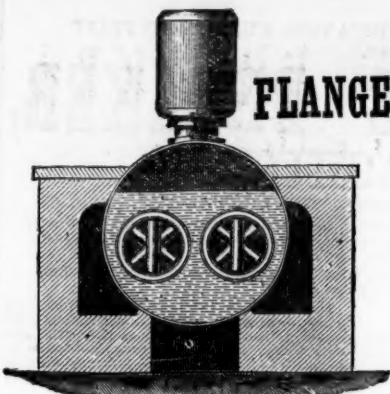
WATERPROOFING COMPOUNDS.—Mr. JAS. WRIGHT, of Moorgate, has specified (a communication from P. E. Minor, of Schenectady, and others, of New York) improvements in waterproof compounds, for coating, wood, metals, and other surfaces. The compound is composed of colophony, Venice turpentine, castor oil, shellac dissolved in alcohol, and glycerine, the ingredients are well stirred together.

HAWKSLEY, WILD, AND CO.'S

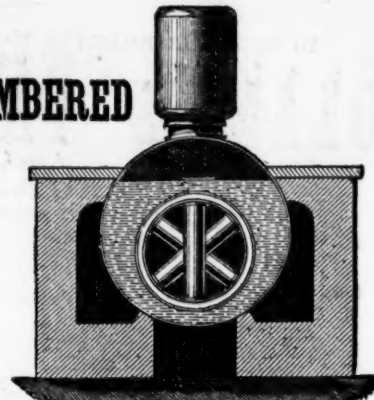
PATENT

FLANGED & COMBUSTION-CHAMBERED

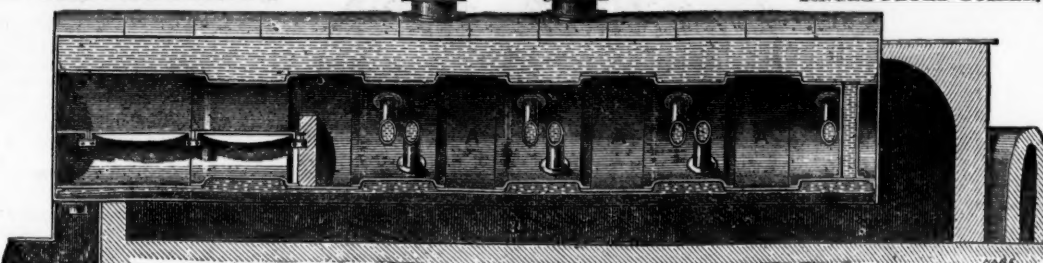
FLUED
BOILERS.



TWO-FLUED BOILER.



SINGLE-FLUED BOILER.



LONGITUDINAL SECTION.

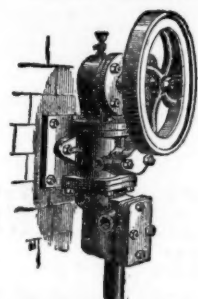
THE FLUES OF THE ABOVE BOILERS ARE MADE OF TWO DIAMETERS, ONE RING OF PLATES BEING 4 inches less than the other, alternately. The smaller rings being flanged, as shown in drawing, are thereby considerably strengthened, besides securing the most material point—a perfect EXPANSION-JOINT. The cross tubes are placed in the smaller rings of the flue, so that any one can easily be taken out and replaced. The larger rings of the flue act as reverberating, combustion, and heat-retaining chambers, greatly economising the fuel. These Boilers are strong, durable, and economical, and have been at work a number of years with the most satisfactory results.

PATENTEES AND MANUFACTURERS:

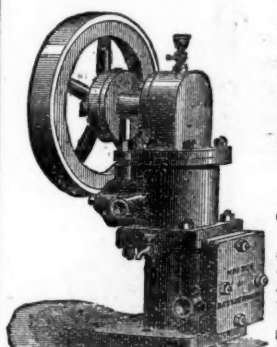
HAWKSLEY, WILD, and CO., Engineers and Boiler Makers,
SAVILLE STREET EAST, SHEFFIELD.

KITTOE AND BROTHERHOOD'S PATENT

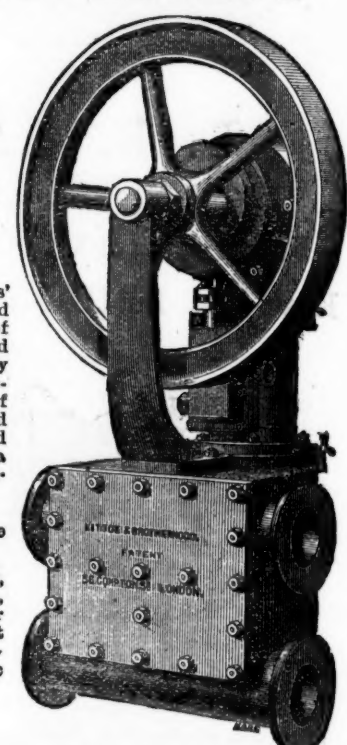
"PARAGON"
STEAM PUMP.



Attached to Wall Plate.



For Feeding Boilers and General Purposes.



Sizes Nos. 1 to 10 deliver from 75 to 21,000 gallons per hour to a height in feet equal to twice the steam pressure in lbs. per square inch.

These Pumps have now borne the practical test of several years' work, under the most varied conditions, with perfect success, and are confidently recommended as the most efficient and durable of their class at present in the market, being of the best materials and workmanship. Their chief advantages are:—ready accessibility to the working parts, although they are entirely enclosed and protected from injury; perfect lubrication in all parts; a minimum of friction combined with self-adjustment for wear. They are fitted with KITTOE AND BROTHERHOOD'S PATENT VALVES, which avoid noise or shock of any kind, even when the pumps are driven at a high speed. By unbolting the front plate all the valves are removed for examination or renewal.

Of the various purposes for which the "PARAGON" PUMPS are eminently suited, the following may be cited:—

For feeding all kinds of Boilers: for pumping in Breweries, Tanneries, Distilleries, Paper Mills, Sugar Houses, Starch, Soap, Dye and Chemical Works, Water, Gas and Sewage Works. For Draining Mines, Quarries, and Irrigating Land; Filling Tanks at Railway Stations; as Fire Engines for Factories, Towns, Mansions, Ships and Dockyards; as Force Pumps for Hydraulic Presses, Lifts, Cranes, &c., &c.

FOR FULL PARTICULARS APPLY TO

MESSRS. BROTHERHOOD AND HARDINGHAM

(Late KITTOE and BROTHERHOOD and formerly WILLIAM FOX)

ESTABLISHED 1825.

Manufacturers of all kinds of Pumping and other Machinery.
56 & 53, COMPTON STREET, GOSWELL ROAD, LONDON, E.C.

CHAPLIN'S PATENT STEAM ENGINES AND BOILERS.

PRIZE MEDAL, INTERNATIONAL EXHIBITION, 1862.

STATIONERY ENGINES,

From 1 to 30-horse power. No building required.

STEAM CRANES,

1½ to 30 tons. For wharf or railway.

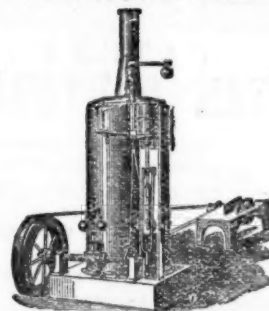
HOISTING ENGINES,

10 cwt. to 15 tons. With or without jib.

TRACTION ENGINES,

6 to 27-horse power. Light and heavy.

DONKEY FEED-ENGINES.



STATIONARY ENGINE.

The ORIGINAL Combined Vertical Engines and BOILERS introduced by Mr. CHAPLIN in 1855. EACH CLASS KEPT IN STOCK FOR SALE OR HIRE.

WIMSHURST AND CO., ENGINEERS,

OFFICE: 117, CANNON STREET, LONDON, E.C.

WORKS: REGENT'S PLACE, COMMERCIAL ROAD EAST, LONDON E.

CONTRACTORS' LOCOMOTIVES,

6 to 27-horse power. For steep inclines and curves

SHIPS' ENGINES,

Hoisting, cooking, and distilling. Passed for half-water.

MARINE ENGINES AND BOILERS,

For light screw and paddle steamers, ships, boats, &c.

STEAM WINCHES,

With or without boilers and connections

DUPLEX PRESSURE FANS.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.
TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT
GRINDERS, MCADAM ROAD MAKERS, &c., &c.**BLAKE'S PATENT STONE BREAKER,
OR ORE-CRUSHING MACHINE,**

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1 1/4 ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS. It has also just received SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States and England. Read extracts of testimonials:—



The Parys Mine Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.

For the Parys Mining Company, H. R. Marsden, Esq., JAMES WILLIAMS.

Elton Emery Works, Manchester.—We have used Blake's patent stone breaker made by you, for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.

THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stones and quartz. *WM. DANIEL.*

Our 15 by 7 in. machine has broken 4 tons of hard whinstone in 20 minutes, for fine road metal, free from dust.

Messrs. ORD and MADDISON, Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.

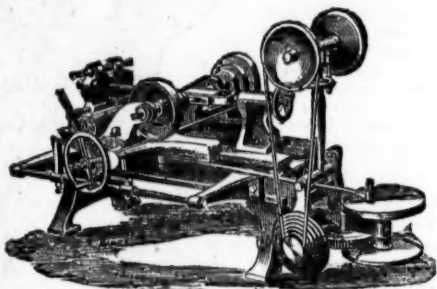
Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or \$75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate.

Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours.

H. R. Marsden, Esq., Weston, near Runcorn.

For illustrated catalogue, circulars, and testimonials, apply to—

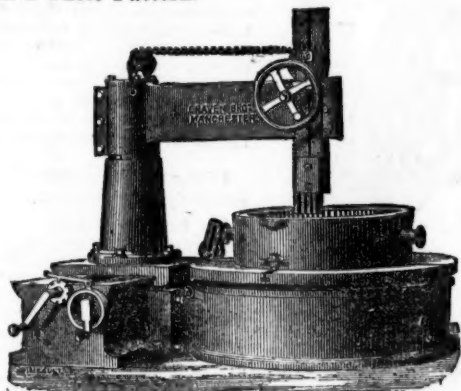
H. R. MARSDEN, SOHO FOUNDRY,MEADOW LANE, LEEDS,
ONLY MAKER IN THE UNITED KINGDOM.**Patent Duplex Cotter-Hole and
Key-Bed DRILLING MACHINE.**

The advantage of this Machine is, that the Drills are only requisite to be half the length of the Cotter-hole required to be cut, as they operate simultaneously from both sides of the object, meeting accurately in the middle, and doing the work in less than half the usual time, besides producing a smooth hole on account of short, stiff Drills being used, thus producing a much better class of work, hitherto unattainable by the Machines with one long Drill.

The Machine is made in three sizes, and often made with double set of Head Stocks, to drill both ends of a connecting rod at the same time.

**Improved WHEEL-MOULDING
MACHINE.**

This Machine will Mould the Teeth of Bevel, Spur, and Worm Wheels, also Straight Racks, of any Pitch with a whole Pattern.



Some of the many advantages in the use of this Machine are, that the Teeth of Wheels are perfectly straight across the Tooth, no tape being required to draw the pattern; the Wheels are true in diameter not depending upon a wood model, which sometimes alters in shape; Wheels of any pitch and form of teeth can be moulded without the use of a whole expensive pattern; and wheels to work into each other can be made mathematically correct in form, at the small cost of segment patterns.

The Machine is made in various sizes to mould wheels of any diameter.

**CRAVEN BROTHERS,
MAKERS OF EVERY DESCRIPTION OF MACHINE TOOLS,
Vauxhall Ironworks, Osborne Street, Manchester.****PATENT
SELF-LUBRICATIVE STEAM & HYDRAULIC ENGINE PACKING.**

This Packing is invaluable to all Users of Steam-Power; it supersedes anything of the kind ever invented; it is now in use in all the Chief Railways and First Firms in this Country and Abroad, and is

THE ONLY PACKING THAT WORKS WITHOUT OIL OR GREASE,

Does not char, is pliable, keeps the rods

COOL, BRIGHT, AND CLEAN,

And lasts longer than any other, thereby

SAVING FULLY 200 PER CENT.

To the User, in oil, labour, and material.

Can be had only from the Agents throughout the country, appointed by

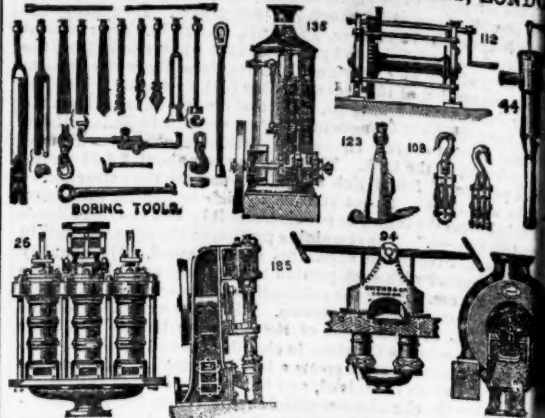
THE SOLE LICENSEES,

[FOR THE LUBRICATIVE PACKING COMPANY],

**HENRY HOUSE AND CO.,
CATHERINE STREET, CITY ROAD, LONDON, E.C.****S. OWENS AND CO.**

Hydraulic and General Engineers,

WHITEFRIARS STREET, FLEET STREET, LONDON



MANUFACTURERS OF

BORING TOOLS, for testing ground for Minerals, Bridge Foundations, Artesian Wells, &c., to any depth.

No. 26.—Treble Barrel and other Deep Well Pumps.

No. 136.—Vertical and other Portable Steam-engines.

No. 185.—Horizontal and Vertical Steam Pumping-engines.

No. 112.—Single and Double-purchase Crab Winches.

No. 108.—Pulley Blocks of all sizes.

No. 123.—Bottle and other Lifting Jacks.

No. 94.—Double-barrel Pumps, for Mine or Quarry use

No. 44.—Portable Wrought-iron Pumps, ditto ditto

No. 102.—Bernays's Patent Centrifugal Pumps, of all sizes.

ALSO EVERY OTHER DESCRIPTION OF
HYDRAULIC AND GENERAL MACHINERY,

COMPRISING

TURBINES, WATER WHEELS, WIND ENGINES,
THE HYDRAULIC RAM, FIRE ENGINES, &c.

Catalogues and Estimates on application.

MTEAR AND CO'S CIRCULAR FELT ROOFING

FOR

GREAT ECONOMY

AND

CLEAR WIDE SPACES

—

For particulars, estimates

and plans, address,—

MTEAR & CO.

20, BUDGE ROW, CANAL

STREET, LONDON

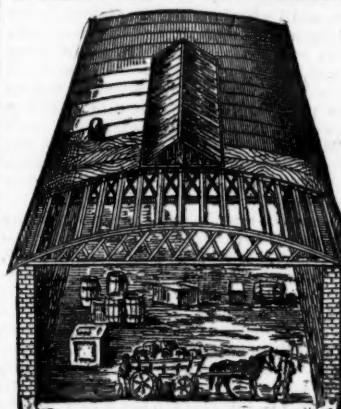
54, PORTLAND STREET,

MANCHESTER;

OR,

CORPORATION STREET,

BELFAST.



The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds, farm buildings, &c., the principle of which are double bow and string girders of best pine timber, sheathed with 1/2 in. boards, supported on the girders by pulleys running longitudinally, the whole being covered with patent waterproof roofing felt. The roofs so combine lightness with strength that they can be constructed to span 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 60s. per square, according to span, size, and situation.

Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.

INDOROUS FELT for lining damp walls and under floor cloths.

DRY HAIR FELT, for deadening sound and for covering steam pipes, thereby saving 25 per cent. in fuel by preventing the radiation of heat.

PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

Wholesale buyers and exporters allowed liberal discounts.

PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required, 8d. per gallon.

**JOHN AND EDWIN WRIGHT,
PATENTERS.
(ESTABLISHED 1770.)
MANUFACTURERS OF EVERY DESCRIPTION OF
IMPROVED****PATENT FLAT AND ROUND WIRE ROPES**

From the very best quality of charcoal iron and steel wire.

PATENT FLAT AND ROUND HEMP ROPES

SHIPS' RIGGING SIGNAL AND FENCING STRAND, LIGHTNING ROD

DUCTORS STEEL AND PLOUGH ROPES (made from w. oster and Hornsby

patent steel wire), HEMP, FLAX, ENGINE LARK, COTTON WASTE,

TARPAULING, OIL SHEETS, & ATTACHE CLOTHS, &c.

UNIVERSITY WORKS, MILLWALL, POPLAR, LONDON.

UNIVERSITY WORKS, GARRISON STREET, BIRMINGHAM.

CITY OFFICE, 30, 5, LEADENHALL STREET, LONDON, E.C.

W. GÜNTHER,**CENTRAL ENGINEERING WORKS OLDHAM**

MANUFACTURERS OF MOST IMPROVED

Silent Fans for blowing and extracting

ing.

" " and Steam Engines

combined, for ventilating

Direct-acting Steam Fans.

Centrifugal Pumps and Pumping

engines.

Turbine Water Wheels, for high

and low falls, and variable quantities

water.

Cast-iron Smiths' Hearths.

General Engineering Work.

ILLUSTRATED PRICE LISTS AND

REFERENCES ON APPLICATION.

IMPORTANT TO CHURCHWARDENS, AND OTHERS,

WITH A VIEW TO POPULARISE.

PUBLIC TIME INDICATORS.

We have produced a speciality that goes beyond the bounds of competition, and beg to call attention to our Works, situated at YARD TURKETT TIME-PIECES, and complete, ready for fixing. Dial 3 feet, figures, gold and blue ground; can be fixed by any joiner in a day.

Price, net cash 10s. 6d.

If 3 feet dial 15s. 6d.

4 feet dial, and stronger works 20s. 6d.

All warranted two years.

Complete Church Clocks from 30s. 6d.

J. BAILEY AND CO.

Turret Clock and Lightning

Makers to the late Earl of Ross, and

Bishop of Manchester, Sir F. C. B. Bart., British and Foreign

Patent, &c., &c.

ALBION WORKS, SALFORD,

LANCASHIRE.

